



Missouri
Department of
Natural Resources

Integrated Strategic Plan

January 2003



The mission of the Department of Natural Resources is to preserve, protect, restore and enhance Missouri's natural, cultural and energy resources and to inspire their enjoyment and responsible use for present and future generations.

Missouri Department of Natural Resources

Vision

The Department of Natural Resources envisions a Missouri where people live and work in harmony with our natural and cultural resources; make decisions that result in a quality environment; and a place where we can prosper today and in the future.

Mission

The mission of the Department of Natural Resources is to preserve, protect, restore and enhance Missouri's natural, cultural and energy resources and to inspire their enjoyment and responsible use for present and future generations.

Values

We take seriously our responsibility of stewardship to protect and enhance the environment in which we work and live, and will consider all aspects of the environment when making decisions. In providing public service we value:

- Integrity and excellence in all we do
- Openness to every point of view
- Diversity in people and approach



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January 2003

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Protection of Missouri's Environment

CLEAN AND ABUNDANT WATER

SURFACE WATER RESOURCES

Why the result is important

Earth is a water planet. We depend upon it for everything we do. By weight, each of us is mostly water. Without enough high quality water, our lives would be simply miserable. Missouri is blessed with a lot of water; most of it is of adequate quality but not outstanding quality. This measure indicates how well Missouri waters are doing as compared to specific needs or uses. These uses include drinking water supply, recreation, navigation, fishing, irrigation, industrial water supply and other services we expect of Missouri's waters.

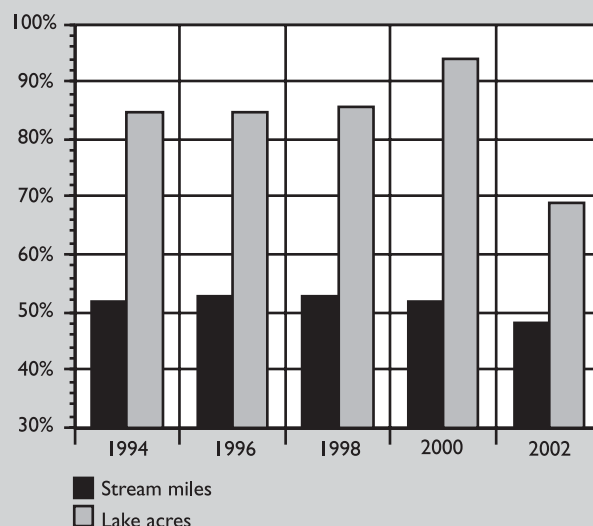
Trend analysis

The number of miles of streams that are impaired, or that fail to meet water quality standards, because of point source (or from a single point such as a pipe) wastewater discharges has generally held steady since 1984, when statewide data on stream quality first became available. In 1984, 105 miles of classified streams were judged to be impaired by domestic or industrial wastewaters. The lowest estimate of point source impaired stream miles was 42 miles in 1996. Since then, estimates have increased in part due to expansion and improvements in the state's water quality monitoring activities that have allowed us to make more accurate estimates of water quality statewide. Estimates also increased due to changing perception and attention to listing waters with problems. Both of these let us focus on these waters better, but neither actually indicate a change in the quality of the resource itself.

Most water quality problems in Missouri are related to nonpoint sources. Nonpoint source water pollution refers to contaminants that do not come from specific conveyances or points such as pipes. It includes contaminants carried in runoff from disperse areas such as fields, roads, parking lots as well as more specific sources such as improperly functioning septic systems. In Missouri, agriculture is considered the primary source of this type of pollution, although urban areas represent a very significant source as do abandoned mine lands. Nonpoint sources affect almost half of the streams and rivers, and about one third of the lakes. Problems include contamination of drinking water sources with pesticides and effects from channelization or the modification of stream channels, mining, and atmospheric deposition of acid and mercury from combustion of coal for energy.

Soil, once it enters water, is termed sediment and is the primary pollutant of Missouri's streams and lakes. While sediment itself can make water murky, it also carries other pollutants such as nutrients and pesticides. Soil erosion on land has been greatly reduced in Missouri due to aggressive

Percent of Missouri's Streams and Lakes Meeting Federal Water Quality Standards



Source: Department of Natural Resources Clean Water Act Section 305(b) report to the U.S. Environmental Protection Agency, 2002

soil conservation programs. Between 1997 and 2001, 622,600 acres of agricultural land were treated to reduce soil erosion through the department's soil conservation efforts. In 2002 alone, over \$25 million dollars was provided to Missouri farmers to help them construct erosion control structures. This cooperative effort has resulted in a 58 percent reduction in soil erosion since 1982.

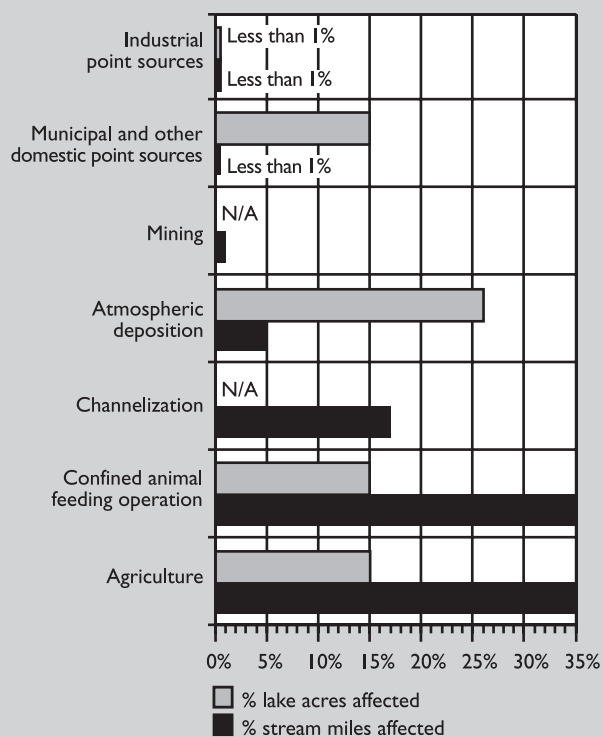
The nutrients carried on sediment have impact beyond Missouri. Increasingly, attention is focused on the impact of nutrients becoming evident in small streams as well as being detected in the Gulf of Mexico. The U.S. Environmental Protection Agency will establish water quality standards for nutrients over the next five years that will aid in assessing and addressing this concern.

How Missouri compares to others



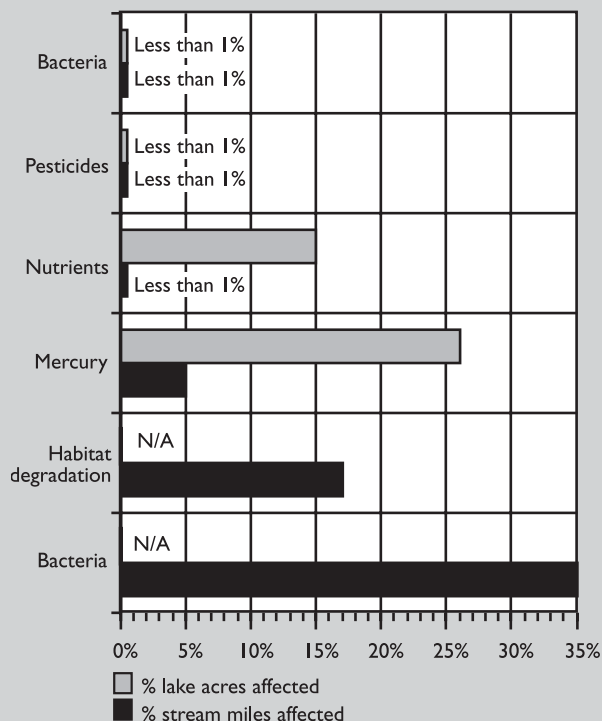
In 1998, states, tribes, territories and interstate commissions report that about 60 percent of the country's streams and lakes were clean enough to support uses such as fishing and swimming. Poor water quality affects aquatic life, fish consumption, swimming, and drinking water across all types of waters. Leading pollutants include siltation, bacteria, nutrients and metals. Runoff from agricultural lands and urban areas are the primary sources of these pollutants. Although the U.S. has made significant progress in cleaning up polluted waters over the past 30 years, much remains to be done to restore and protect the nation's waters.

Major Sources of Water Pollution in Missouri



Source: Department of Natural Resources Clean Water Act Section 305(b) report to the U.S. Environmental Protection Agency, 2002

Major Contaminants of Streams and Lakes in Missouri

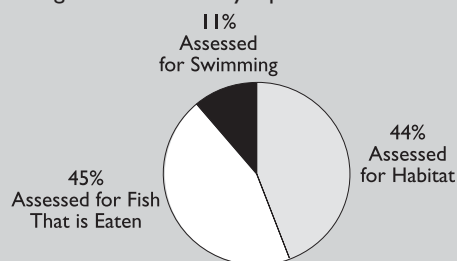


Source: Department of Natural Resources Clean Water Act Section 305(b) report to the U.S. Environmental Protection Agency, 2002

For those waters that maintain permanent flow or at least permanent pools that support aquatic life during times of low flow. These account for about half of the total stream miles in Missouri.

MISSOURI PROFILE

51,978 Total Stream Miles
Including Streams That Dry Up and Do Not Flow All Year



293,305 Total Lake Acres



Source: Department of Natural Resources Clean Water Act Section 305(b) report to the U.S. Environmental Protection Agency, 2002

Since 1982 Missouri has reduced its rate of soil erosion by more than any other state. By 1997 Missouri had decreased its rate of erosion and gone from second (1982) to seventh place in the United States. For more information on the progress of soil conservation efforts in Missouri please refer to the Land Stewardship section of this plan.

What works

The department continually strives to balance the needs of industry, cities and towns, with protection of our water resources. Efforts to increase permitting efficiency and effectiveness, open discussion with all stakeholders on rules and regulation, more than \$1 billion in financial assistance for construction of wastewater treatment plants, research and assistance with compliance issues are the key tools to either maintain or improve water quality in Missouri.

Control of many nonpoint sources such as agricultural erosion from cropland and pasture, runoff of fertilizer, pesticides and animal waste, are addressed by Missouri's nonpoint source management program. This program works with federal, state and local governments, universities, private groups and individual landowners to implement watershed projects that use nonpoint source control practices and often monitor water quality results.

Programs with dedicated funding sources have worked best. A tax on coal has funded reclamation of abandoned coal mined lands nationwide. Fourteen years of such reclamation in Missouri has reduced the number of stream miles impaired by acid mine drainage from about 100 down to 15.

The soil conservation programs of the department funded by a state sales tax for soil erosion control, includes

projects that address soil conservation in an entire watershed, rather than scattered individual streams. This whole watershed approach affects improvement on all the streams, lakes and land that is coordinated and effective. This program, coupled with federal soil conservation programs, has reduced soil erosion on cultivated cropland in Missouri from 10.9 tons per acre (1982) to 5.6 tons per acre (1997).

Control of nonpoint water pollution sources such as runoff from farms, cities, mining areas and construction sites is still essentially a voluntary program. Regulations are in place to prevent leakage from underground storage tanks and for the secondary containment of bulk agricultural chemical storage sites. Large sand and gravel mining operations require a general permit for storm water runoff and smaller operations have been provided with guidelines for best management practices (BMPs), in addition to the permit required of all sand and gravel operations. Storm water runoff discharge permits are now issued for construction sites and other areas with more than five acres of disturbed ground. Federal regulations newly adopted by Missouri reduce the size of disturbed ground requiring a storm water permit from five acres to one acre.

Nutrient enrichment of surface waters from wastewater discharges and runoff from the surrounding landscape cause the growth of nuisance algae, poor clarity and low dissolved oxygen, which can harm or kill fish and other aquatic organisms. Concern over nutrient enrichment of large, recreational reservoirs has led to recent changes in the state regulations for discharges of wastewater. These regulations now impose limits on phosphorus amounts on most wastewater discharges in the Table Rock Lake and Lake Taneycomo watersheds.

The department coordinates an extensive system of water quality monitoring and cooperates with other agencies in performing special water quality studies. Routine coordination of monitoring activities with other agencies avoids overlap and provides input on monitoring study design. The major water quality monitoring work includes a fixed station network, intensive surveys, a toxics monitoring program, a biological monitoring program and fish tissue monitoring.

Water pollution control efforts on point source discharges have traditionally operated through the formal processes of financial assistance for public facilities, permitting and inspection. Enforcement is utilized where necessary. Over the past 30 years, this approach has been very successful in achieving an adequate degree of wastewater treatment for point source discharges.

Hog and poultry production in confined animal feeding operations (CAFO's) are major industries in Missouri. The large amount of animal waste generated at these facilities requires proper management to prevent water pollution. Major livestock facilities are regulated through permits like other major sources of water contaminants. The Missouri Clean Water Commission has revised its regulations to bring

confined animal feeding operations (CAFOs) into the point source permit program, consistent with federal requirements.

Concerns

Soil erosion resulting in sedimentation in our water resources and loss of productivity for our land resources affects 35 percent of Missouri's streams. Currently the rate of soil erosion in Missouri is 5.6 tons per acre per year. Soil erosion is above acceptable levels on 5 million acres. In order to reach our goal of 95 percent of Missouri's agricultural land eroding at tolerable levels or less, we need to reduce erosion on 3.7 million acres. While conservation efforts have been very successful, the hard work ahead is maintaining those savings and reaching those acres that have been more difficult to address.

Channelization has caused aquatic habitat degradation in 17 percent of Missouri's streams. Large channelization projects affecting many miles of streams are no longer occurring but many short projects continue to reduce the number of miles of natural stream channels statewide. Streams that were channelized many years ago provide poor aquatic habitat and contribute to flooding, high water velocities and streambank erosion.

There are about 400 CAFOs in Missouri. These facilities generate large amounts of animal manure and have the potential to cause serious water pollution problems. Concerns center on the cumulative impacts of numerous small animal production facilities in an area as well as the potential for contamination from large facilities.

Evidence is accumulating that the fish and invertebrate communities of many streams in Missouri are suffering from the degraded quality of the aquatic habitat. Physical changes to the stream channel, stream flow patterns, degraded conditions in the areas adjacent to streams and upland land use changes all contribute significantly to this problem.

Continuing suburban development impacts streams by direct loss of stream channels and habitat by shortening stream channels, installation of culverts, removal of vegetation along streams, disturbance of stream banks, and impacts due to development with associated increased storm water flows. Sediment in these stormwater flows threatens streams. In addition, continuing and increasing volumes of wastewater discharged to surface waters, especially small streams, is resulting in lower dissolved oxygen levels that threaten aquatic life.

Mercury levels in fish in Missouri appear to be increasing over time. Re-evaluation of human health risk factors for mercury has led the Missouri Department of Health and Senior Services to issue an advisory against consumption of largemouth bass greater than 15 inches in length for children 12 years of age and under, pregnant women and women who may become pregnant. The advisory pertains to all waters in Missouri.

Nutrient enrichment of large, recreationally important reservoirs appears to be increasing. Heavy residential development around portions of Lake of the Ozarks and Table

Rock Lake threatens water quality in many small coves and shoreline areas. Water clarity in the main portion of Table Rock Lake, which was historically very clear, is declining. The large size of these lakes and rugged local topography make centralized collection and treatment systems for wastewater difficult. Nutrient problems from wastewater treatment plants and septic tanks are aggravated by increasing confined animal production in the watersheds of these lakes.

Abandoned lead-zinc mines and their tailings continue to impact waters decades after mining has ceased. While Missouri's Superfund program addresses some of these concerns, the long-term impacts are expected to remain. Although new mineral extraction operations are managed under state permits, areas of Missouri very sensitive to disruption are being investigated for mining potential.

Objective 1

Using 1998 as the base year, by 2005 increase compliance with water-quality standards for: 18.4 stream miles out of 275.9 stream miles polluted by animal waste, active and abandoned mine lands, domestic point-source discharges, and industrial discharges; and 3,012 lake acres out of 4,566 impaired lake acres.

Objective measure

Number of the 276 stream miles and 4,566 lake acres listed as impaired in 1998 and returned to compliance with water quality standards.

Key strategy

Develop and implement total maximum daily loads for impaired waters.

Objective 2

Maintain the supply of water in the Missouri River to support the beneficial uses of water supply, irrigation, industrial use, livestock and wildlife watering, aquatic life and navigation.

Objective measure

Flow discharged through Gavins Point Dam together with Missouri River tributaries, sufficient to support the river's beneficial uses in Missouri

Key strategies

Participate with all stakeholders in the revision of the Missouri River Master Manual as proposed changes impact Missouri's flood control benefits, drinking water supplies, river commerce, and environmental and recreation needs.
Oppose water withdrawals through the Garrison Diversion and other means or projects.

Objective 3

Continue and focus efforts that prevent or address pollution, and enhance water quality.

Objective measure

These efforts all support the outcome of improved water quality, the percent of waters that meet their beneficial uses.

Key strategies

Issue and enforce Phase II storm water permits for municipalities and disturbances of one acre and larger, and other regulated discharges. Use the environmental management systems approach to improve water quality performance by those organizations potentially affecting state waters.

Objective 4

Increase compliance of registered dams with dam-safety standards from 98.0 to 100 percent by 2005.

Objective measure

Percent of regulated dams meeting safety standards

Key strategies

Continue to work with the Federal Emergency Management Agency in assessing vulnerabilities of dams to terrorist attacks and coordinating emergency response efforts.
Conduct training courses for dam owners around the state on how to prepare emergency-action plans.
Inspect existing dams that do not have valid registration permits.

Groundwater Resources

Why the result is important

The quality of well water is greatly influenced by well construction. Most public drinking water supply wells and many private wells are deep, properly cased and properly grouted. These wells rarely have contaminants. However, some older inferior quality private wells are shallow, not properly cased and grouted. Septic tanks, feed lots or chemical handling sites near the well can easily contaminate these wells.

About 34 percent of Missouri's population relies on groundwater for their source of drinking water. Many of our aquifers are vulnerable to contamination. Therefore, protecting our aquifers must be a priority and proper well construction ensures that the public has the ability to use this resource while minimizing the degradation of the aquifer. By proper construction of wells and encouraging aquifer protection we are ensuring safe drinking water for future generations and protecting the groundwater resource.

Trend analysis

The well drilling law is a relatively recent addition to Missouri statutes, passed in 1985 and amended in 1991. Familiarity and compliance with the law have increased over the past decade to a level that about two thirds of wells meet construction standard requirements.

Research in Missouri has shown that two-thirds of wells contaminated by pesticides are less than 35 feet deep. The three most common problems in private wells are bacteria, nitrate and pesticide contamination. It is estimated that about 30 percent of private wells occasionally exceed drinking water standards for bacteria, 30 percent for nitrate and about five percent for pesticides. State regulations include standards for construction and wellhead protection for all new wells. This measure provides an indication of performance by the well drinking community in safely tapping the groundwater resource.

How Missouri compares to others



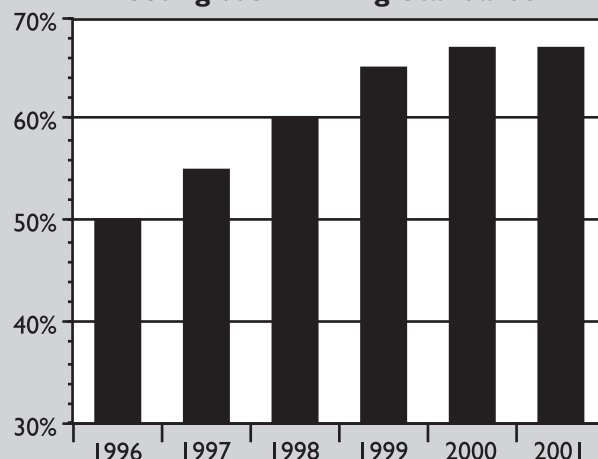
Iowa, Michigan and Wisconsin have a well construction compliance rate of over 90 percent; while Missouri's compliance rate is estimated to be 67 percent.

What works

Continued educational efforts pay off in the long run. Both the public and the industry must embrace the value of proper well construction and aquifer protection.

Gov. Holden recently convened a Well Certification Team to review the process of certifying wells. The team was composed of drillers, department staff and the general public. They recommended several changes to the well certification process to improve compliance such as requiring the use of Global Positioning Systems to pinpoint well loca-

Private Wells Constructed Meeting Well Drilling Standards



Source: DNR Geological Survey Program

There are wells drilled that are not reported and therefore not certified as being properly constructed.

tions, better reporting to the industry on the status of applications for certification, requiring well certification as part of the loan approval process, continuing education for the industry, and increased educational efforts.

Concerns

Monitoring to assess the groundwater resource's quantity is inadequate and difficult. At present, the department is not well equipped to address these issues comprehensively, although there has been much progress in recent years. Some areas of the state have begun experiencing groundwater shortages, during drought conditions or times of increased draw from groundwater. These generally have occurred in the southwest part of the state, although shortages also occur locally in other areas. Information on these trends is provided by an increasing number of groundwater level observation wells, as well as directly by users of groundwater. At this point there is not enough information to draw conclusions about long term trends, although long term water planning is a basic need. Large quantity water withdrawals (100,000 gallons per day or more, from either surface water or groundwater) have been required to be reported to the Water Resources Program since 1983 (Major Water Users Registration), and this may provide a rough indication of total quantities and trends.

Statewide groundwater quality is infrequently assessed. The last large-scale assessment was conducted in 1994 to 1995 in response to concerns that the flood of 1993 introduced contamination into groundwater. Controlled pumping tests are required for all community public water supply wells. The analysis of pump test information will enable us to better evaluate the aquifers used by these systems.

Drilled well are reported after drilling is complete which does not provide the department the opportunity of on-site observation or interaction during well drilling and related activities. Problems that may have been apparent at the time become masked and literally buried out of sight. While there are some techniques for examining the physical integrity of wells after construction, they pale in comparison to on-site observation during construction.

While new wells constructed since 1991 are required to be properly closed when taken out of service, most wells pre-date this requirement and are not legally required to be properly closed unless it is proved that they are a contaminant source. This is of particular concern where public water supplies are installed in an area and many other

wells are no longer used, but not sealed. In addition, many older wells remain as a direct conduit to Missouri's groundwater resources, threatening water quality as well as physical safety.

Additional groundwater protection measures are needed. Missouri now has in place programs that register and inspect underground storage tanks and oversee the cleanup of leaking underground tank sites, programs for wellhead protection, sealing of abandoned wells and closing of hazardous waste sites. A complete groundwater protection program would also include a groundwater quality monitoring program and educational programs for those involved in the application of farm chemicals, transporters of hazardous materials and the general public.

Objective 1

Increase compliance with private well construction regulations from 67 percent in 2002 to 90 percent in 2005.

Objective Measure

Percent of private wells in compliance with regulations

Key strategies

Continue to develop and evaluate new enforcement procedures to increase compliance with regulations of the Well Drillers Law and the Oil and Gas Law.

Implement the Missouri Results Initiative recommendations

Enforce regulations of the Oil and Gas Law.

Investigate potential funding sources to seal abandoned wells, bore holes and open mine shafts to prevent the discharge of surface water into groundwater supplies.

Objective 2

Increase the availability, quality and usability of geologic information as it relates to groundwater quantity and quality.

Objective measure

Percent of available geologic information related to groundwater.

Key strategies

Increase the classification of losing streams

Increase well logging and rock core descriptions in areas lacking subsurface geologic and groundwater information.

Increase aquifer characterization in areas of increased groundwater usage and land use development.

Provide technical expertise and geologic data to assist in the prevention of groundwater contamination from gasoline containing methyl tertiary butyl ether (MTBE).

Finalize completion of a series of geographic information system data layers containing detailed geologic, hydrologic, environmental and other information, along with the location of gasoline service stations and pipelines in order to protect aquifers from MTBE releases to be used in evaluating groundwater resources.

Public Drinking Water

Why the result is important

Water is essential for life itself and the availability of good quality drinking water is essential for a good quality of life. The ultimate goal is to protect the health of Missouri's citizens by assuring an adequate volume of drinking water provided by public water systems and water quality that meets health related standards. This measure is based on periodic monitoring of water supplies and provides an indicator of the quality of water as it comes from the tap.

Trend analysis

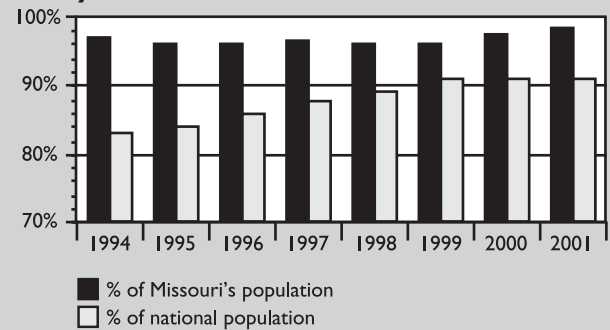
The population served by Missouri's public water systems meeting health-based standards has always been high. The quality of drinking water in the state is generally very good and almost all of the water systems provide safe water to their customers. As new contaminants are regulated it often takes time for systems to add or optimize treatment or take other steps to address the new problem. This causes fluctuations in the percentages, even when assistance and enforcement activities related to existing rules are kept constant and the long-term trend is upward.

How Missouri compares to others



The best comparison is between Missouri and the nation as a whole. We are significantly above the national average and have been above EPA's 2005 target of 95 percent for as long as we have been tracking compliance. Our good quality groundwater, especially in southern Missouri, is a primary factor. Missouri does not have some of the naturally occurring contaminants like arsenic that plague other states. Most of our water is not naturally corrosive so issues related to lead and copper pipe are not the concern they are in other states. Nitrates and pesticides, while certainly a threat from agriculture, are not yet getting into the deep groundwater used by public water systems. Any surface water used for public drinking water is treated to remove these contaminants.

Missourian's Served by Public Drinking Water Systems That Meet Federal Standards



Source: DNR Public Drinking Water Program

The population served is the number of consumers provided water by community water systems in Missouri. Community water systems provide water to places where people live like cities, water districts, subdivisions, and mobile home parks. The public water systems that meet health-based standards have had no Maximum Contaminant Level violations for any contaminant nor violated any treatment technique requirement for the year. About 5 to 15 percent of the population is served by private systems and is not represented here.

What works

Keeping actions and programs ahead of new regulations has been effective in preventing many compliance problems before they start. Also, a balanced approach with a technical assistance and training early, and enforcement later if needed has produced a high compliance rate.

Concerns

Protection and continued operation of drinking water systems will remain a high priority as Missouri strives to address security concerns. Processes must also be put in place to treat radon as a newly regulated contaminant.

Objective 1

Return overall compliance rate for public water systems in Missouri to 90 percent by 2007 after implementing new regulations from the federal Safe Drinking Water Act amendments of 1996.

Objective measure

Percent of public drinking water systems that meet government standards health based standards

Key strategies

Assure adequate source water supply for water systems so that lower quality alternative sources do not have to be used.
Protect systems from disruption or contamination by natural or manmade disasters so they continue to provide high-quality waters.
Perform preliminary planning, monitoring, education, and other work on upcoming rules, like EPA's Microbial/Disinfection By-product Cluster, to prepare water systems for potential impacts.

CLEAN AIR

Air Quality

Missouri's air sustains us in everything we do. Whether working in a garden, waiting for a bus or hitting home runs, clean air is essential to our health and our very existence. Missouri's air quality has steadily improved over the last decade. Today over 65 percent of the population lives where the air quality meets government standards. To continue this positive trend, Missouri will have to balance environmental quality with the needs of industry and Missouri's citizens. The department seeks to work together with everyone who has a stake in improving our air quality.

Why these results are important

Clean air supports life and poor air quality can harm our bodies, plants and animals and other natural processes on which we depend. Airborne contaminants can enter our bodies and do damage easier than through food, water or skin contact. In Missouri we judge air quality using the National Ambient (outdoor) Air Quality Standards established by the U.S. EPA under the Clean Air Act. The standards address six "criteria pollutants" considered harmful to public health and the environment: ozone, lead, inhalable particles, carbon monoxide, nitrogen dioxide and sulfur dioxide. Ozone, carbon monoxide and lead have been the primary pollutants of concern in Missouri. By measuring the status of these pollutants, we can assess the degree of safety or potential for harm for people and the environment.

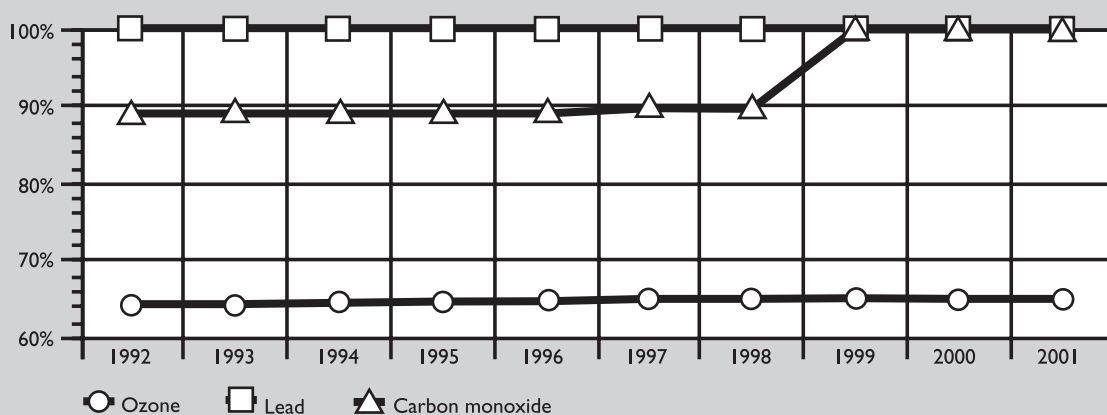
Ground-level ozone is a colorless gas and it is the most harmful part of what we sometimes call "smog." Ozone is not directly emitted. It forms on hot, stagnant summer days as sunlight causes a reaction between volatile organic com-

pounds and nitrogen oxides. Vehicles, power plants and industrial boilers are common sources of nitrogen oxides. Gasoline-powered vehicles and manufacturing operations are major sources of volatile organic compounds. Ozone causes throat irritation, congestion, chest pains, nausea and labored breathing as well as aggravation of existing lung or heart conditions, allergies and asthma. Ozone is especially harmful to those who work or play outside. Ozone is also harmful to plant life, damaging forests and reducing crop yields. In contrast, high altitude or stratospheric ozone, which is the same chemical compound, acts to partially shield the planet's surface from harmful ultraviolet light from the sun. Freons used for refrigeration, such as in automobile air conditioners, were banned to reduce the destruction of this protective layer of ozone.

In Missouri, lead smelters primarily produce airborne lead and its compounds. Airborne lead poses the greatest danger to children under age six. The air quality standard was been established to protect their health. Low doses damage the central nervous system of children and unborn infants, causing seizures, mental retardation and behavioral disorders. In children and adults lead causes fatigue, disturbed sleep, decreased fitness and damage to kidneys, liver and blood-forming organs. While the long-term trend in lead is positive, there are specific challenges such as the lead emissions from the lead smelter at Herculaneum.

Carbon monoxide, formed by the incomplete combustion of fuel, is one of the most common pollutants. More than 75 percent of carbon monoxide emissions come from vehi-

Percent of Missourians Living Where Air Quality Meets Federal Standards



Population shifts, as well as air quality changes, are reflected in the measure. Many Missourians live outside urban core areas and the data reflects the increased population in our suburban areas. However, we are working to bring the urban core areas in compliance with air quality standards so all Missourians, regardless of where they work or live, have clean air to breath.

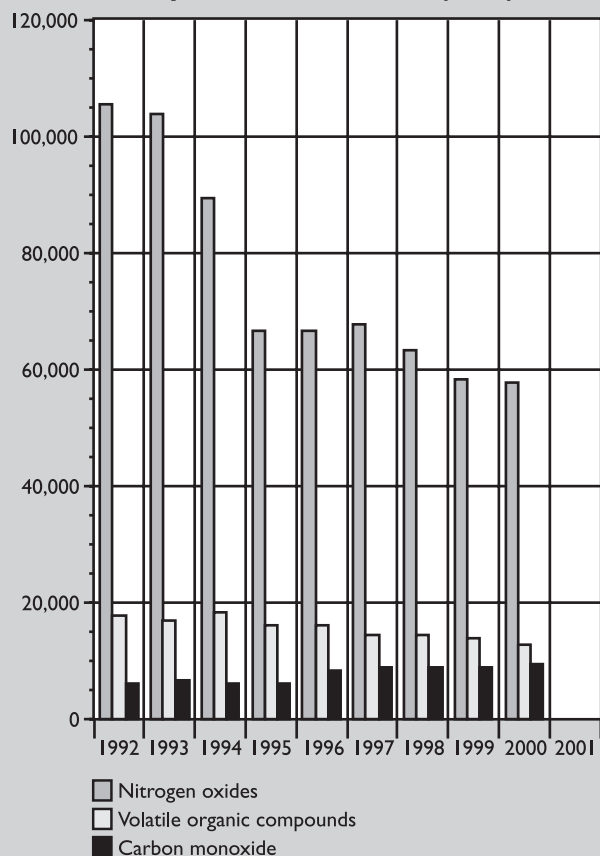
The carbon monoxide non-attainment area comprises the City of St. Louis and the portion of St. Louis County within the Interstate 270 loop. Air monitors have shown compliance with the National Ambient Air Quality standards for twelve years and on March 29, 1999, the EPA formally redesignated the region as an attainment area.

Number of Days St. Louis and Kansas City Ozone Levels Were a Health Risk Based on Federal Standards

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
St. Louis	2	5	1	2	2	8	8	3	3	3	5	1	1
Kansas	0	2	1	1	1	0	5	0	2	3	0	1	0

Source: DNR Air Pollution Control Program

Emissions of Nitric Oxides, Carbon Monoxide and Volatile Organic Compounds in St. Louis (tons)



Source: DNR Air Pollution Control Program

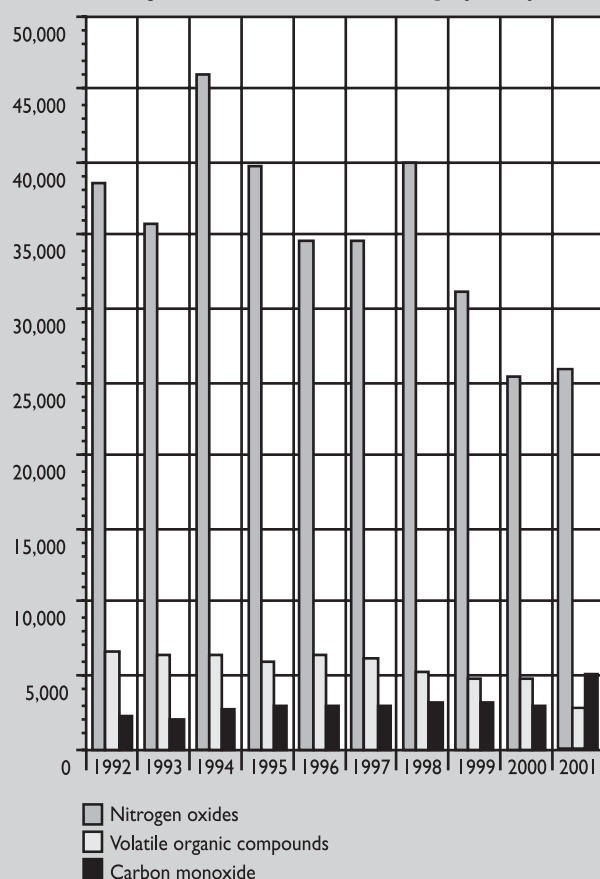
St. Louis area includes St. Louis City, St. Louis, Franklin, Jefferson, and St. Charles counties. Point-source emissions only, such as an industry. Mobile sources (such as cars) not included.

cle exhaust. The highest concentrations are caused by heavy traffic in metropolitan areas. Though deadly, carbon monoxide changes quickly to carbon dioxide, which is not dangerous. Carbon monoxide also causes impaired vision and manual dexterity, weakness and mental dullness.

Trend analysis

With regard to ozone, the St. Louis and Kansas City areas have shown an overall decrease in the number of days when air exceeds the health-based ozone standard. Kansas City currently meets the ozone standard while St. Louis does not. However, the number of days that the St. Louis area exceeds the standard has steadily declined. Only

Emissions of Nitric Oxides, Carbon Monoxide and Volatile Organic Compounds in Kansas City (tons)



Source: DNR Air Pollution Control Program

Kansas City area includes Platte, Clay and Jackson counties. Point-source emissions only, such as an industry. Mobile sources (such as cars) not included.

one exceedance has been monitored in each of the last two years. The trend in ozone precursors – volatile organic compounds and nitrogen oxides – has steadily declined over the past decade.

Lead emissions are a concern near three lead smelters in the state. These include the smelters at Glover, Bixby and Herculaneum sites. The Glover and Bixby smelters have attained compliance with air standards, while the Herculaneum smelter met the air standard for lead for the very first time in the first quarter of 2002. Historical and on-going deposition of lead from these smelters will continue to be an area of concern.

A portion of the St. Louis metropolitan area had a histo-

ry of exceeding the health-based standard for carbon monoxide. However, more recent monitoring has shown compliance with the carbon monoxide standard. On March 29, 1999, the EPA formally recognized that this area now meets standards for carbon monoxide.

How Missouri compares to others



The other states in Missouri's EPA Region (Nebraska, Iowa and Kansas) do not have ozone, lead or carbon monoxide nonattainment areas.

The nearest ozone nonattainment areas are Chicago and Milwaukee. The St. Louis ozone nonattainment area includes three adjacent counties in Illinois. The Kansas City ozone maintenance area includes two adjacent counties in Kansas.

What works

Measures to address vehicle and industrial emissions have been implemented in the St. Louis and Kansas City areas. In Kansas City, the cornerstone of the air quality improvement is low vapor pressure gasoline that reduces emissions of volatile organic compounds from automobiles and trucks. Kansas City also employs some industrial controls for printers, surface coating operations and manufacturers.

In St. Louis, a vehicle inspection and maintenance program, cleaner burning reformulated gasoline, vapor recovery, industrial controls and education have helped to show improvements in air quality. Reductions in nitrogen oxide emissions from areas outside of St. Louis have also helped reduce ozone concentrations. These reductions have occurred at electric generating facilities.

Concerns

In future years, growth in emissions may occur. Continued increase in vehicle miles traveled will offset some of the benefits of cleaner burning gasoline and improved vehicle emissions. New facilities located outside of the St. Louis area that produce large quantities of nitrogen oxide emissions may adversely impact air quality if their emissions come into this area. Lead emissions from smelters that threaten the health of neighboring populations must be addressed.

The EPA has adopted new air quality standards for ozone and particulate matter. Areas in Missouri may violate these new standards when they are implemented.

Objective 1

Regulate emissions and reduce the measured concentrations of air pollutants to meet the National Ambient Air Quality Standards as required by the State Implementation Plan.

Objective measure

Number of sites with one-hour ozone violations in St. Louis and Kansas City

Key strategy

Revise the St. Louis Ozone Plan to reduce the emissions of volatile organic compounds by an additional nine percent (64.65 tons/day), if St. Louis is reclassified as a serious nonattainment area.

Objective 2

Reduce lead emissions in the Herculaneum nonattainment area and achieve the lead standard. Note: The 2001 average was 5.2 ug/m³ (micrograms per cubic meter) and the first quarter of 2002 averaged 1.1 ug/m³ [the second quarter will likely be higher, and probably above the standard, but will not be available until early August]. The standard is 1.5 ug/m³.

Objective measure

Number of lead violations in Herculaneum

Key strategy

Complete the implementation of the lead plan for the Herculaneum smelter and to conduct ambient monitoring in the nonattainment area. The plan may be revised if it is insufficient to meet the present standard or if the present standard is revised downward.

Objective 3

Improve construction and operating permit processes.

Objective measures

Permit quality (consistency, timeliness, accuracy of application)

Key strategy

Implement recommendations from the Air Construction Permit Team and the Air Operating Permit Team.

Pristine Air

Scenic vistas are enhanced immeasurably by a clear view. Visibility impairment is caused by small particles in the atmosphere that scatter light. There are several ways to measure the impairment of visibility, and the department uses these to assess this measure in areas where high visibility is expected. Unlike most air pollution control programs, this program is not aimed at solely protecting human health or preventing the release of toxic air pollutants into the environment. Instead, the goal of the program is to improve visibility in the nation's most pristine environments.

Why the result is important

Visibility in wilderness areas is important to people, and is part of the expected experience when visiting them. Visibility impairment is often referred to as regional haze because of the great distances that haze-causing pollutants can be transported by the wind. Haze obscures the clarity, color, texture and form of what we see, and is caused by fine particles in the atmosphere. Some particles are of natural origin, and some are caused by the activities of people and industry. These pollutants can be directly emitted to the atmosphere or they can be formed there as vapor phase compounds react in the atmosphere to yield compounds that are solids.

Trend analysis

Monitoring for visibility is new in Missouri, so long term trends are not yet available. Seasonal variability is likely. In Missouri visibility impairment is likely dominated by sulfate particles. Sulfate particles are formed by complex atmospheric chemical reactions of sulfur dioxide gas. Sulfur dioxide

is emitted primarily by combustion sources that use fuels containing sulfur, such as coal. Visibility impairment trends, therefore, follow the trend in sulfur emissions. Because acid rain regulations have produced decreased sulfur dioxide emissions, it has been speculated that there has been a small improvement in visibility.

How Missouri compares to others



Historically there has been a lack of visibility monitoring in the Midwest. Therefore, it is difficult to compare Missouri with neighboring states.

What works

It is too early in our studies to know what emission control measures would be most effective at improving visibility. The primary short-term goal is to develop a better understanding of the mechanisms of visibility impairment in Missouri. Monitoring will aid in this effort.

Concerns

Participation in regional air pollution planning is a new regulatory approach. Historically, pollution control efforts have been limited to either federal efforts or state and local programs. Having a regional consortium of states develop a "menu" of control options may result in unforeseen conflicts. As difficult as it is to reduce emissions in Missouri, it may now be necessary to have air pollution sources in other states control emissions for the benefit of Missouri and others downwind. Likewise, Missouri sources may be asked to control emissions that impair visibility in other states.

Objective I

Develop a Regional Haze State Implementation Plan by 2008 as required by federal regulations.

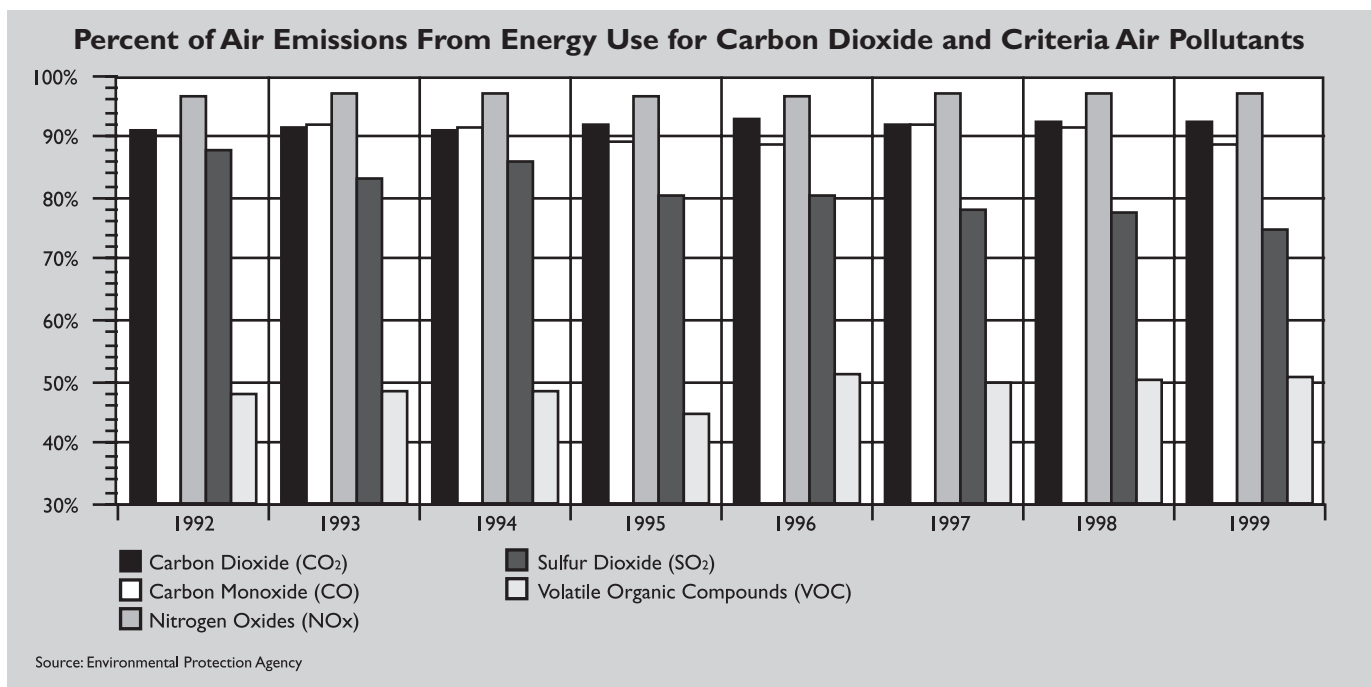
Objective measure

Establishment of a state implementation plan

Key strategy

Analyze data and determine visibility impairment culpability using computer modeling and data analysis.

Emissions of Carbon Dioxide and Criteria Pollutants From Energy Use



Estimates of energy-related and total emissions of criteria pollutants are taken from EPA's National Air Quality and Emissions Trends Report and supporting databases. The EPA Trends data includes estimates of emissions from area, mobile and non-regulated sources that are not included in other air-quality measures in this plan. Estimates of CO₂ emissions are by the Energy Center based on energy use data from the EIA State Data Report and other data sources documented in the Energy Center's Greenhouse Gas Emissions Trends & Projections Report, 1999.

Why the result is important

Carbon dioxide emissions are significant because CO₂ is the major greenhouse gas that may contribute to climate change. Energy use is the primary source of carbon dioxide emissions (92.4 percent) and emissions of four criteria pollutants in Missouri: more than 97 percent of the emissions of oxides of nitrogen (NO_x), 89 percent of carbon monoxide (CO), 75 percent of sulfur dioxide (SO₂) and 50 percent of emissions of volatile organic compounds (VOCs).

Climate change is the long-term fluctuation in temperature, precipitation, wind, and other elements of the Earth's climate system. The Earth's atmosphere is one part of that climate system. The chemical composition and the concentration of the gases in the atmosphere are a primary determinant of temperature. An increase in certain gases is believed to be the cause of the Earth's greenhouse effect, resulting in a net increase in the absorption of energy by the Earth. Although the Earth's atmosphere consists mainly of oxygen and nitrogen, neither plays a significant role in the greenhouse effect. The greenhouse effect is primarily a function of water vapor, carbon dioxide, and other trace gases. Carbon dioxide is continuously emitted to and removed from the atmosphere by natural processes on Earth. Human activity can cause additional quantities of carbon dioxide to be emitted or stored and thus change the atmospheric concentration. The rising concentrations of greenhouse gases as a result of human activities may alter

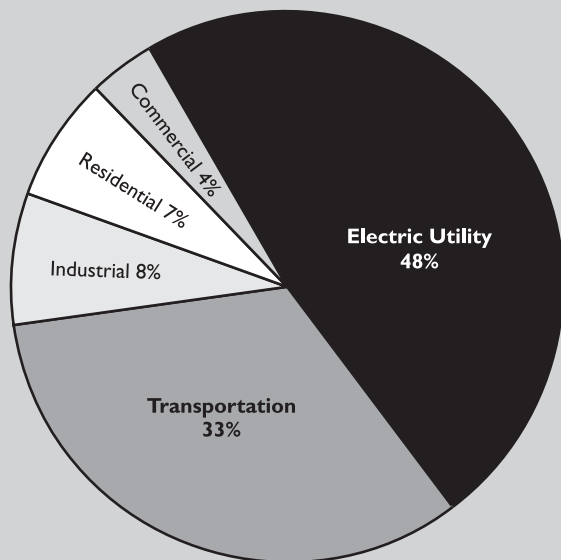
temperature and other aspects of climate change.

Computer models project that increased concentrations of greenhouse gases will result in increased average temperatures and changes in patterns of precipitation. These changes can disrupt natural systems such as forests, fisheries, water resources, energy sources, air quality and human health.

In recent years federal, state and local energy and environmental officials have recognized the increasing convergence of energy, environmental and economic development issues as they work to provide communities with cleaner air, low-cost reliable energy and greater economic growth. The department pursues approaches on the most significant energy and environmental challenges through emission control strategies that reduce multiple pollutants, and harmonizing strategies for reducing criteria pollutants with strategies for reducing greenhouse gas emissions. With few exceptions, strategies that mitigate greenhouse gas emissions will also result in reduced emissions of other air pollutants.

A no-regrets approach to greenhouse gas reduction options relies on identifying ancillary environmental and economic benefits. Examples of these benefits include: increased economic productivity from cost-effective implementation of energy efficiency and renewable energy;

Carbon Dioxide Emission in Missouri by Sector (1997)



Source: DNR Energy Center

increased energy security and reduced vulnerability to price spikes or supply shortages through efficiency and the development of state renewable energy resources; reduction in congestion and maintenance costs for infrastructure resources such as electric transmission and distribution, pipelines, highways and bridges; and improved environmental management including harmonized reduction of greenhouse gas emissions and criteria pollutants.

Trend analysis

Missouri has had an overall increase of 26 percent in statewide carbon dioxide emissions from fossil fuel combustion between 1992 and 1999. Emissions in the year 2015 are projected to range from 154 million tons to 170 million tons in Missouri. Compared to the baseline year of 1990, which had emissions of 111 million tons, this represents an average annual growth rate of about 1.3 to 1.7 percent per year. The largest changes in carbon dioxide emissions from 1992 through 1999 occurred in the utility sector (+42 percent), industrial sector (+33 percent) and transportation sector (+28 percent). The majority of growth in the transportation sector reflects the amount of petroleum used. It is primarily due to increased emissions from jet fuel, diesel and gasoline.

How Missouri compares to others



Missouri's per capita greenhouse gas emissions were lower than the national average in 1990; 5.8 tons per person compared to U.S. emissions of 6.4 tons per person. However, aggregate greenhouse gas emissions appear to have increased 26 percent in Missouri between 1990-1999 compared to a 12 percent increase nationwide. About two-thirds of states including Missouri have conducted greenhouse gas emission inventories and about half have initiated action plans. Missouri has

developed a report that identifies no-regrets action options that would result in reduced greenhouse gas and other emissions. Missouri has also completed a significant study in 2001 (Missouri Energy Policy Task Force).

What works

Carbon dioxide emission reductions are tied to the use of fossil fuels for energy production. Any plan to reduce greenhouse gas emissions must include complementary and coordinated supply-side and demand-side components – reducing the emissions associated with energy production, particularly electric generation while simultaneously introducing technologies and incentives for energy consumers to use electricity and other energy sources more efficiently and with less waste.

The department has participated in national efforts to improve appliance efficiency and has passed laws encouraging the design and construction of energy-efficient state buildings and the use of high-fuel-efficiency vehicles. Financial incentives provided to schools and local governments go toward increasing energy efficiency in those facilities and decreasing overall energy expenditures. Implementing use of energy efficiency and renewable energy technologies are also extremely vital strategies to solving both the energy and global warming crises.

Solid waste reduction and recycling help in preventing global climate change by decreasing the amount of heat-trapping greenhouse gases that are linked to everyday trash. Recycling reduces fossil fuel combustion associated with product manufacturing and as a result, greenhouse gases are reduced. Recycling decreases the amount of organic waste that is landfilled, thereby decreasing landfill methane emissions. Recycling reduces emissions of conventional pollutants associated with fossil fuel combustion, eliminates emissions associated with manufacturing materials and also reduces energy used to manage wastes. Further, recycling often reduces the energy demand associated with raw materials acquisition and manufacturing with virgin inputs.

Concerns

Changes in the atmospheric composition of gases may result in noticeable changes in the Earth's climate. Temperature and precipitation extremes and fluctuations are already being recorded. The 20th century's 10 warmest years all occurred in the last 15 years of the century. The frequency of extreme rainfall events has increased throughout much of the United States. Snow cover in the northern hemisphere and floating ice in the Arctic Ocean have decreased. Increasing concentrations of greenhouse gases are likely to accelerate the rate of climate change.

Objective 1

Decrease pollutants from energy use through energy-efficiency loan programs to schools and local governments and weatherization assistance to residential consumers that would otherwise occur by 2005 as follows:

Reduce carbon dioxide emissions - 83,566 tons per year

Reduce nitrogen oxide emissions - 323 tons per year

Reduce sulfur oxide emissions - 657 tons per year

Objective measure

Carbon dioxide and criteria pollutant emissions reductions from energy use from weatherization and loan programs (tons per year)

Key strategies

Provide energy-efficiency loans to schools and local governments and weatherization assistance to low-income, elderly and disabled Missourians.

Provide technical assistance to facilitate harmonized action options that reduce greenhouse gas emissions and criteria pollutants as well as benefit the state's economy and environment.

Disseminate best available state, regional and national data and climate protection information, including data from the department's 1995 Greenhouse Gas Source Inventory, Greenhouse Gas Emissions and Trends Report, Report of Analysis of Greenhouse Gas Emissions Reduction Options and Greenhouse Gas Fact Sheets.

Objective 2

Reduce carbon dioxide emissions from state government facilities and fleet operations by 10,000 tons per year compared to emissions that would otherwise occur by 2005.

Objective measure

Carbon dioxide emissions reductions from state government facilities and fleets

Key strategies

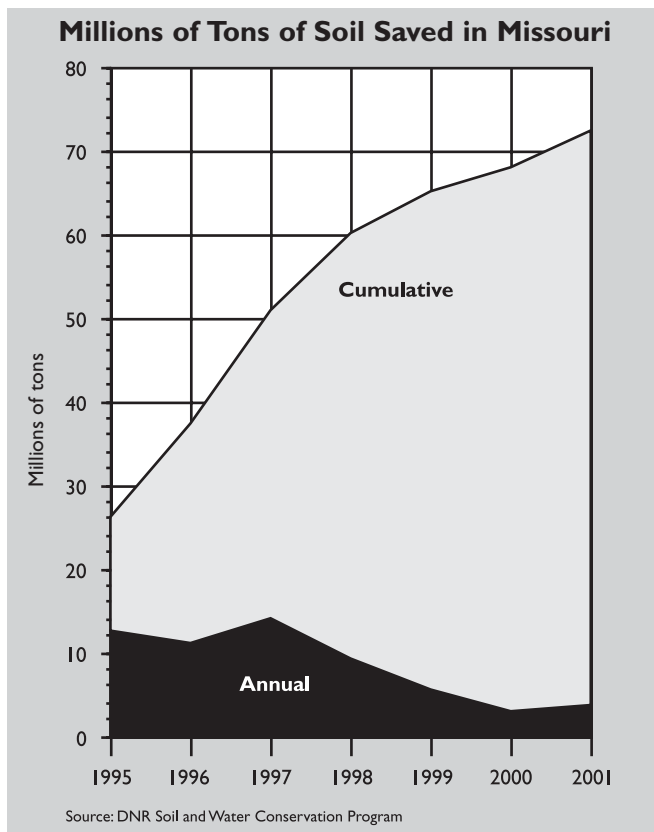
Promote energy-efficiency measures and displacement in the use of fossil fuels.

Disseminate best available state, regional and national data and climate protection information, including data from the department's 1995 Greenhouse Gas Source Inventory, Greenhouse Gas Emissions and Trends Report, Report of Analysis of Greenhouse Gas Emissions Reduction Options and Greenhouse Gas Fact Sheets.

LAND STEWARDSHIP

Soil Conservation

Missouri's land resources provide us with the nourishment we need to sustain life, the raw materials necessary to meet life's everyday needs as well as numerous recreational opportunities. To this end, the department is responsible for minimizing the environmental and health-related impacts associated with the use of Missouri's land resources.



Why is this result important?

Soil erosion is a natural event. However, with agriculture it has often accelerated to a rate that depletes the soil resources making it either unfit for cultivation or continually needing the addition of chemicals in the form of fertilizers and pesticides to maintain some level of productivity. Our primary goal is to reduce erosion to tolerable levels (expressed as "T" in tons/acre/year) or to a level that agriculture can continue while maintaining soil productivity and integrity. As few as ten years ago, Missouri was second in the nation for its rate of soil erosion, a ranking that needs to be drastically reduced. Our goal is have 95 percent of Missouri's agricultural land protected so as to maintain its productivity.

Trend analysis

The cumulative tons of soil saved continue to increase a positive trend. The annual tons of soil saved have

Comparison of Progress Made in Soil Conservation Between Missouri and Tennessee

	Tennessee (Erosion rates in tons/acre/year)	Missouri
1982	11.0	10.9
1987	10.8	8.4
1992	9.1	6.6
1997	7.7	5.6

Source: National Resource Inventory, USDA Natural Resource Conservation Service

Since 1982, Missouri has reduced its rate of soil erosion by more than any other state. By 1997 Missouri had decreased its rate of erosion and gone to seventh place in the United States. Because of its climate, topography and the types of soils, Missouri still has significant erosion problems on cultivated cropland. A comparison of Missouri to other states for the rate of erosion from cultivated cropland follows.

decreased over the past few years. This is due to a number of factors including:

- Until 1997, the Soil and Water Conservation Program had a reserve fund from which district could request significant additional funding for cost-share conservation practices. This was used extensively for erosion control practices. These funds are depleted and thus unavailable for conservation practices.
- As more land is treated for erosion, the remaining acres are more difficult and costly to bring to tolerable soil erosion levels.
- The calculations are only for sheet and rill erosion. Another significant erosion problem the districts are treating for now includes gully erosion.

How Missouri compares to others



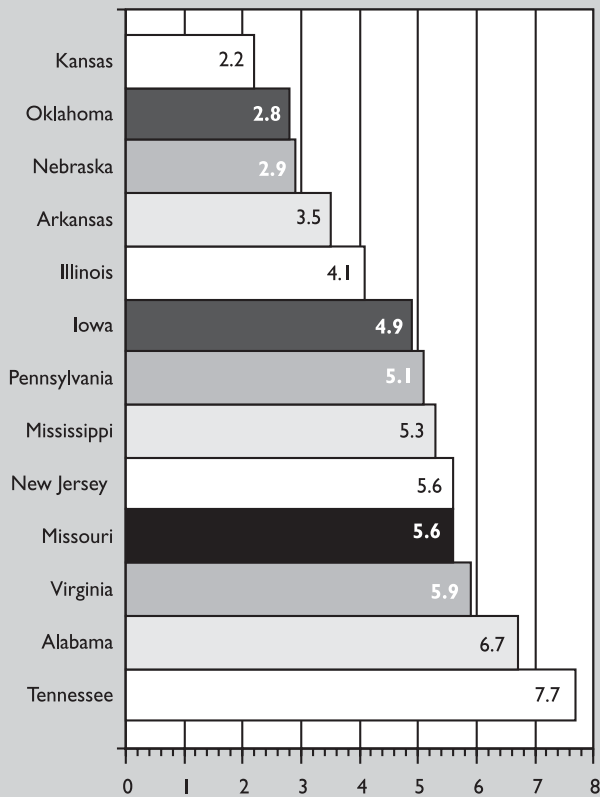
The national average for soil erosion on cropland is 3.1 tons/acre/year. In 1982 Missouri was second to Tennessee in erosion from cultivated cropland. The following information shows the progress made in Missouri as compared to Tennessee.

Factors influencing the outcome

There are several factors that influence the amount of soil saved. These include:

- Economic conditions especially as they affect the landowners that may be interested in a cost-share practice. If they do not have their share of the match funds available, they are unable to participate.
- Technical assistance available from the districts and NRCS technicians to lay out the conservation practices.
- If the weather is too hot or too wet when a practice is usually installed, construction may be delayed or the practice may not function as designed.
- Interest and priorities of the soil and water conservation districts
- Policy decisions by the Soil and Water Districts

Rates of Erosion in Tons/Acre/Year (1997 National Resources Inventory, Natural Resources Conservation Service)



Source: DNR Land Reclamation Program

Commission and the amount of funds available for the construction of soil conservation practices.

What works

The success of the program is in providing incentives to landowners to voluntarily adopt conservation practices on their land to prevent erosion. Practices such as terraces or

grassed waterways constructed in a cultivated field slow down the movement of water that causes the soil to erode. There are a number of practices available, and for each field there are particular practices that best fit that situation. The partnership between the districts, the Natural Resources staff of the Soil and Water Districts Commission and NRCS in assisting the landowners with their conservation needs is also a big factor in making this a successful program to reduce erosion.

Financial incentives have been strongly supported by Missourians through the Parks and Soils Sales Tax. The soil's portion of the tax funds various payments for soil conservation practices and equipment that directly reduce the rate soil erodes from agricultural land. This support is up for reauthorization by 2006.

Concerns

As more acres are treated, the remaining acres are more difficult and expensive to get to tolerable soil erosion rates. Also, it is important to consider the acres that have been treated in the past and encourage continued efficacy of those practices so that they don't backslide and create erosion problems in the future.

Another concern is that the data from the National Resource Inventory are not statistically reliable at the county level, and therefore we are not able to identify erosion problems for individual districts to better target efforts.

A complicating factor in determining how far we are from our goal is the adoption of a new erosion prediction equation by Natural Resource Conservation Service. The Revised Universal Soil Loss Equation (RUSLE) was adopted a few years ago but has not yet been used in the data collection process. This improved methodology has the potential for changing the status of many cultivated cropland acres from greater than "T" to within acceptable erosion limits.

Objective I

Increase the percentage of Missouri agriculture land eroding at or below tolerable rates from 65 percent in 1982 to 95 percent by 2006.

Objective Measure

Percent of agricultural land eroding at the rate which is tolerable ("T")

Key strategies

Focus efforts on conservation practices that control erosion on agricultural land by working with the local soil and water conservation districts.

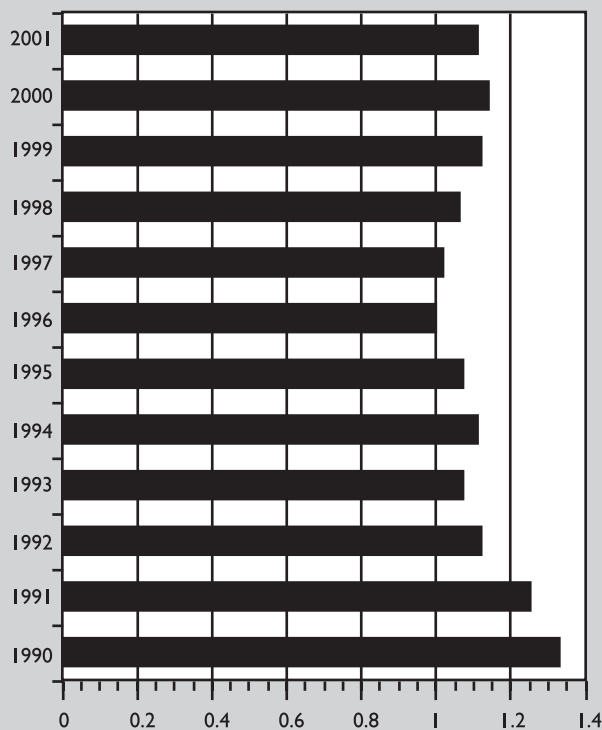
Work with agency partners and others to identify and implement opportunities to improve processes, procedures and coordination to increase the effectiveness of soil and water conservation work.

Continue to coordinate soil erosion efforts with those improving water quality to decrease the amount of sedimentation in Missouri's streams.

Sound Management and Cleanup of Solid Wastes

Solid waste is material that has been discarded because it is worn out, is used up, or is no longer needed, such as packaging, newspapers and used writing paper and broken appliances. Many things thrown out as waste may have the potential to be recycled or reused.

Per Capita Disposal Rate for Solid Waste
(tons per year)



Source: DNR Solid Waste Management Program

Why is the result important?

Traditionally, each year more trash is created and thrown away. The per capita disposal is an indicator of the amount of trash disposed of each year. Knowing that the amount of trash typically increases each year, the trends in the disposal rate can also indicate the levels of waste reduction, reuse, recycling and composting activities. Missourians have two basic choices when dealing with their trash. Dispose of it or follow one of the three “R’s” – reduce, reuse, or recycle. The three “R’s” require behavioral changes. An individual must make a conscious effort to purchase products with less packaging or with recycled content, place recyclable materials in a recycling bin instead of the trash can or to actively compost yard waste. Disposal of trash means either the construction, maintenance and proper closure of solid waste landfills in Missouri, disposal in another state, or illegal dumping. By increasing our reuse and recycling of solid wastes, we can decrease the need or extend the life of our solid waste landfills.

Trend analysis

Over an eleven-year period the per capita disposal has decreased from 1.33 tons per person per year to 1.11 tons per person per year rate. The lowest point during this period occurred in calendar year 1996 with a 1 ton per person per year disposal rate. The increase shown between 1996 and 2000 is attributed to a robust economy that provided an increase in personal consumption expenditures whereby per capita spending increased.

How Missouri compares to others



Missouri has the highest per capita disposal rate of the nine states in our area. Its per capita recycling rate also is significantly higher than that of the other states. It is thought that the increased per capita recycling rate is a result of a decade of technical and financial assistance along with planning that included educational activities encouraging good solid waste management practices.

Comparison of Solid Waste Management for Various States

	Population (millions)	Waste produced (millions of tons)	Disposal (tons)*	Recycling (tons)*	Incineration (tons)*
Arkansas	2.7	2.1	0.42	0.35	0.01
Illinois	12.4	15.1	0.86	0.34	0.01
Iowa	2.9	2.9	0.64	0.34	0.01
Kansas	2.7	3	1.02	0.1	0.01
Kentucky	4	4.4	0.76	0.32	0
Missouri	5.6	10.3	1.14	0.7	0
Nebraska	1.7	1.8	0.83	0.25	0
Oklahoma	3.4	3.8	0.98	0.01	0.11
Tennessee	5.7	5.2	0.5	0.31	0.1

* per capita

Source: DNR Solid Waste Management Program

Missouri's data includes tonnage from residential, commercial, institutional, construction, demolition and industrial waste streams. This waste is disposed of in Missouri's sanitary and construction and demolition landfills, or in landfills located out-of-state. The data from the bordering states may not include all of the waste streams that are represented in Missouri's data. Also, it is unclear whether the data from bordering states includes out-of-state waste disposal. In our experience, each state chooses its own method of calculating these figures; consequently they are not easily comparable.

Factors influencing the result

A waste characterization study conducted in 1997 showed that approximately 59.6 percent of waste disposed of by Missouri was municipal solid waste. Households, institutions such as schools, office buildings, and small business' such as restaurants and retail stores, generate municipal solid waste. The traditional recyclable materials are also those materials falling under the municipal solid waste are typically consumed and recycled by the general public, i.e. aluminum cans, plastic pop bottles and milk jugs, paper and

steel cans. There has been an increase in infrastructure development for collecting these types of recyclables. Focusing on diverting from landfills non-municipal solid waste materials could have the benefit of reducing the per capita disposal rate.

What works

Since 1992 Missouri has had twenty solid waste management districts that implement local solid waste management plans. During this time, the number of communities in Missouri that have recycling collection services has increased from 154 in 1992 to 403 in 2000. Yard waste collection services have also increased from 194 in 1992 to 311 in 2000.

Appropriate management of solid waste is needed and requires a variety of strategies including communicating what can be placed in a landfill and providing financial mechanisms to implement alternatives to landfills. This is accomplished through technical and financial assistance,

encouraging waste reduction, reuse, recycling, energy recovery and improved processing and proper disposal.

Another strategy to promote recycling and reuse of materials is to use volumetric or bag based pricing. Currently, a home or business pay a fee for solid waste collection that is a set amount each month allowing any volume or bags of trash to be thrown away. If fees were based on the amount actually thrown away, either by volume or number of bags, it would better reflect the total cost of solid waste disposal, and encourage recycling to reduce pickup costs.

Concerns

Without the regulation of solid waste disposal facilities and oversight of the implementation of local and regional solid waste management plans places the state's citizens, property and natural resources at risk.

Objective 1

By 2006, maximize the amount of solid waste recovered.

Objective measures

Tons of demolition and construction, industrial and commercial and food waste diverted from landfills and recycled
Tonnage of waste tires reused beneficially
Tonnage of solid waste going to landfills

Key strategies

Develop and promote feasible alternatives to the disposal of wastes in landfills.
Promote volumetric or unit-based pricing mechanisms that account for the full cost of solid waste disposal and promote municipal integrated solid waste systems.
Encourage food-waste composting, reuse of construction and demolition waste and commercial and industrial waste reduction to address the largest portion, by weight, of waste that is disposed in landfills.
Provide financial assistance for projects that result in a decrease in the amount of materials disposed of and an increase in the amount reused.
Assist businesses with their ongoing solid waste reduction or recycling programs, and increase the recovered waste made into new products.
Assist businesses beneficially reusing waste tires.

Objective2

By 2006, maximize compliance of solid waste disposal areas.

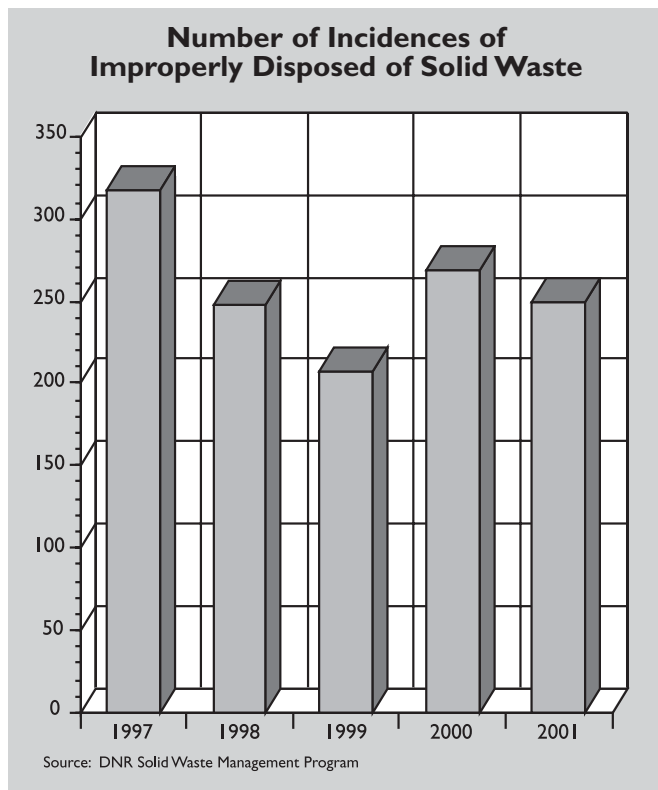
Objective Measures

Percent of landfills meeting requirements of Subtitle D of the Resource Conservation and Recovery Act
Number of stream miles contaminated due to leachate discharges from landfills
Number of incidences of unresolved methane gas migration problems at landfills

Key strategies

Promote public awareness and community involvement in the locating of landfills through meetings held during the initial permitting process. This provides an opportunity and greater role for groups or individuals that may be potentially impacted by a landfill in their area.
Assist landfills with uncorrected methane gas migration problems to identify and remediate occurrences.
Assist landfills to ensure proper installation of groundwater monitoring systems to verify that landfills are not polluting groundwater.
Coordinate with the Geologic Survey and Resource Assessment Division to ensure that landfills are designated and constructed appropriately.

Incidence of Improperly Disposed of Solid Waste



Why the result is important

Illegally disposed of solid waste is a health and environmental detriment and at least an eye sore to the community. In some localities, a reduction in illegal disposal or large-scale clean-up (waste tires for example) signifies a positive environmental, health and visual impact.

Trend analysis

The FY 2000 number went up due to an illegal dumping

enforcement initiative conducted in the department that generated a large number of citations.

How Missouri compares to others



At this time we are not aware of other states tracking similar data.

Factors influencing the result

Out of the way dumping may not be noticed or reported, resulting in fewer illegal dumps identified. In addition, a poor economy may cause an increase in incidences of illegal dumping. On the other hand, the department's initiatives for reporting and locating illegal dumps will increase the numbers of illegal dumps found.

What works

Besides the surveillance cameras and on-line reporting form, the department conducts Local Environmental Enforcement Program workshops across the state to help locals start their own dumping enforcement programs. The department also sends informational letters regarding the requirements of the law to contractors, fire departments, county officials, and waste haulers. Some regions conduct special initiatives to enforce against illegal dumping in their region in conjunction with disseminating educational information.

Concerns

Improper processing or disposal of solid waste can cause health and environmental problems such as ground and surface water pollution, air pollution and the transmission of disease. Lack of resources for education and enforcement could lead to increased illegal dumping.

Objective I

By 2006, minimize the amount of improperly disposed solid waste.

Objective measures

Number of illegal solid waste dumps cleaned up (including tires)

Key strategies

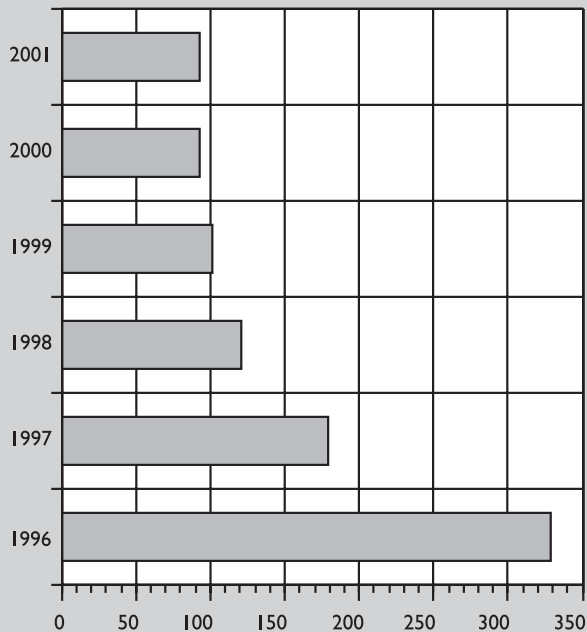
Develop and promote economical and convenient solid waste management services accessible to all Missourians.

Clean up illegal waste sites, and promote local programs that discourage illegal dumping in order to prevent future cleanups of such sites.

Work with counties and cities with active programs to discourage illegal dumping.

Protection of Land Resources Through Responsible Management of Hazardous Substances, Wastes and Materials

Average Amount of Hazardous Waste Generated per Generator (short tons)



Source: DNR Hazardous Waste Program

Why this result is important

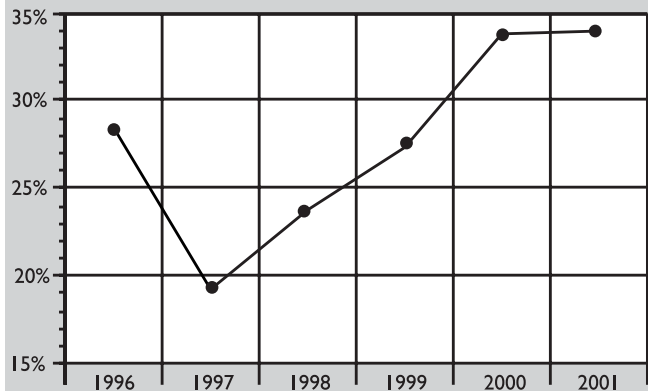
Chemicals affect our everyday lives. They are used to produce almost everything we use, from paper and plastics to medicines and food to gasoline, steel and electronic equipment. More than 70,000 chemicals are used regularly around the world. But when these are disposed of improperly, they can have harmful effect on humans, plants and animals. Even when used properly, many chemicals can still harm human health and the environment.

When these hazardous substances are thrown away, they become hazardous waste. Hazardous waste is most often a by-product of a manufacturing process-material left after products are made. Nearly all manufacturing, repair and cleaning businesses generate some form of hazardous waste. Some hazardous wastes come from our homes. For example, our garbage can include such hazardous wastes as old batteries; bug spray cans and paint thinner. Regardless of the source, unless we dispose of hazardous waste properly, it can create health risks for people and damage the environment. This can occur by contamination of the air, soil, ground water, surface water and the food chain.

Trend analysis

Over the past five years, there has been a significant

Percent of Hazardous Waste Recycled, Used for Energy Recovery or Reused Relative to the Amount Generated



Source: DNR Hazardous Waste Program

decrease in the total amount of hazardous waste generated in Missouri. While a reasonable percentage of Missouri's hazardous waste is recycled, energy recovered or reused in some manner, the single largest hazardous waste generator in the state incinerates its own waste on-site. Until the situation changes with that generator, these percentages are unlikely to change significantly.

How Missouri compares to others



Exact comparisons between Missouri and other states are somewhat difficult because of varying reporting methodologies. The comparisons most easily seen can be made using the Biennial Report common to all states, the District of Columbia, Navajo Nation, Puerto Rico, Trust Territories and the Virgin Islands. In 1999 Missouri ranked 24th in total tons of hazardous waste generated and 22nd in the total number of facilities that generate a large amount of hazardous waste.

What works

Ideally, the generation of hazardous waste is minimized and the amount reused or recycled maximized. Reuse, recycling and energy recovery are the most environmentally desirable management methods for managing hazardous waste. The more waste managed by one of these methods, the less negative impact there is to the environment of Missouri. If this is not possible, hazardous waste is safely contained while it is stored, transported and properly disposed of to prevent an accidental release into the environment.

The Missouri Hazardous Waste Management Law established a "cradle-to-grave" system for proper handling of

hazardous waste from generation to recycling, energy recovery, treatment or final disposal. The law encourages businesses to reduce and recycle hazardous waste as much as possible.

Concerns

It is a continuing challenge to ensure that the reuse, recycling or energy recovery from hazardous wastes is conducted in environmentally responsible ways. It is a concern that some operations may not be able to successfully carry out these processes without releases or creating risk to themselves, the environment and the public.

Even the most technologically advanced landfills will leak

some day. Tanks used for storing petroleum products and other chemicals can leak and catch fire. Transportation accidents, such as train derailments and overturned trucks, can occur while transporting hazardous substances. There are also cases of intentional and illegal dumping of hazardous waste. When hazardous wastes are released in the air, water or on the land they can spread, contaminating even more of the environment and posing greater threats to our health.

It continues to be a concern that all facilities using hazardous materials are secure and any materials transported are safe from either potential terrorists or irresponsible management.

Objective 1

By 2005 increase the percentage of hazardous waste entities in compliance from 78 percent to 79 percent.

Objective measure

Percentage of hazardous waste entities in compliance

Key strategy

Promote the use of Environmental Management Systems at hazardous waste facilities which encourages management of all wastes on site with commitment to regulatory compliance, as well as innovative approaches such as pollution prevention, wise use, and performance-based approaches to environmental practices

Objective 2

By 2005 increase underground storage tank compliance with 1998 upgrade and leak detection requirements from 83 percent to 85 percent.

Objective measure

Percent of underground storage tanks in compliance

Key strategy

Prevent groundwater contamination by ensuring that gasoline containing methyl tertiary-butyl ether (MTBE) is stored only in tanks meeting the U.S. EPA 1998 upgrade standards, especially in the St. Louis ozone non-attainment area (for air quality).

Objective 3

Annually maintain oversight activities to ensure that appropriate reuse continues at 80 sites where contaminants remain after cleanup is completed.

Objective measure

Sites inspected for oversight of remaining contaminants

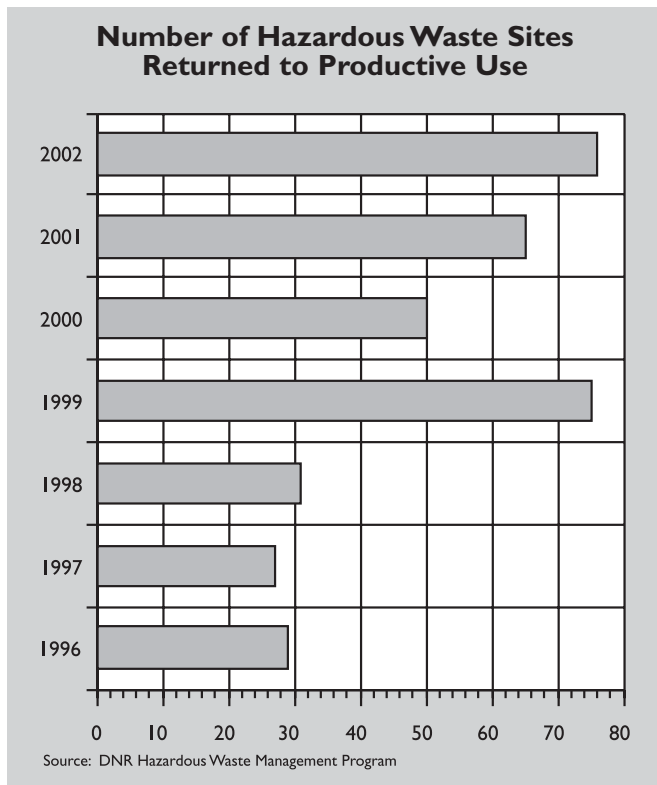
Key strategies

Facilitate risk-based cleanups and appropriate property reuse for economic development and protection of human health and the environment.

Develop processes and funding mechanisms to ensure sites remediated with contaminants remaining in place remain protective of human health and the environment in the long term.

Develop a comprehensive and accessible geographic information system for tracking sites with contaminants left in place to ensure the availability of information such as location, contaminant, and remediation history.

Return of Hazardous-Waste-Contaminated Land to Productive Use



A considerable amount of Missouri's natural resources have been contaminated with hazardous materials over the years from mining, smelting, manufacturing, light and heavy industry, service oriented businesses, military and other governmental activities. Even a tiny amount of some hazardous materials can cause serious health concerns and harm a relatively large amount of air, land, water and groundwater resources. As a result, the department became involved in cleaning up Superfund sites, both federal and non-federal, in 1980, followed by Corrective Action cleanups in 1984 and Voluntary cleanups in 1995.

Why this result is important


This measure provides a quantitative number of contaminated sites that have been remediated and returned to productive use, and whose threats have been controlled or eliminated entirely. It must be recognized that sites range in size from less than an acre at the corner gas station to thousands of acres in a weapons complex.

Trend analysis

As state cleanup programs have matured, the number of sites remediated and returned to productive use increased in 1999, more than doubling the annual output compared to previous years. The number of sites remediated since 1999 has remained at a higher annual rate than previous with the numbers fluctuating dependent on size and com-

plexity of the sites. "Mega-sites" such as areas impacted by mining, military and other industrial sites, including those with contaminated groundwater can be vast (thousands of acres) and can take lengthy periods of time to remediate. Therefore, the overall number of sites cleaned up in the future could decrease, especially federal and non-federal Superfund sites, but the area remediated could increase. The number of sites remediated may not continue to be a reliable indicator of the area (e.g. Acres) at sites that is being put back into productive use or made available for reuse. For example, the RCRA Corrective Action Program has been proactively promoting use of expedited no further action determinations for portions of sites so as to free up portions of those site for redevelopment. This typically occurs in advance of activities that would be counted as "remediation" under this category.

How Missouri compares to others



Nationally, the number of hazardous material sites in Missouri's EPA Region (including Iowa, Kansas and Nebraska) is relatively small when compared with most other EPA Regions. In this region Missouri has the largest universe of hazardous material sites. Missouri remediates more sites than Iowa and Nebraska and has similar results compared to Kansas. Missouri also has more than twice as many organized Superfund community advisory groups (eight) than the other three states put together, supporting a strong public involvement program.

What works

Taking a balanced approach has proven to be the most successful. The cornerstone of that approach is to involve the public, potentially responsible parties and other state and federal agencies in the process as early as possible. Public involvement includes community advisory groups and numerous other types of public involvement such as meetings, availability sessions and one-on-one visits. The results from those efforts have been to gain community acceptance, trust and insight that more often than not contributed to the final remedial activity and its' acceptance.

As soon as a potentially responsible party is identified, staff has moved quickly to invite them to become part of the investigation and/or remediation process. Where there are viable potentially responsible parties a high percentage of them become involved in the process. This is especially true in the Superfund and Registry programs. The Voluntary Cleanup Program has facilitated the cleanup of numerous sites the department had no knowledge of prior to the owner coming forward.

Concerns

There are not enough resources to address the task that lies ahead. There are a daunting number of sites that will need investigation, and many of these sites will need to be remediated to protect human health and the environment. Overall funding for the programs involved in site remediation have remained relatively flat for several years and this trend is expected to continue. States have received an increasing administrative and technical burden as federal regulations and requirements are adopted and authorized. Innovative state-initiatives (e.g., Superfund's Cooperative Program, RCRA's Expedited Corrective Action Program, and the Voluntary Clean-up Program) are developed and implemented to expedite cleanups, but these efforts will not relieve the overall burden. The number of known sites that need to be investigated will take in excess of forty years at current levels of funding. Remediation will take even longer. Environmental media contaminated with hazardous materials will continue to impact human health and the environment above risk-based levels, especially at sites that have not been discovered or where little is known.

Active and inactive lead sites are a large concern because all the sites have not been identified and the many that have been identified are severe health threats. Historically, just about every lead site identified has a high percentage of children under six years of age with elevated blood levels, ranging from 14 percent to as high as 56 percent in one area. This is a grave concern as lead is known to impact the central nervous system and has lasting impacts in young children ranging from lowering of intelligence levels to developing behavior disorders to stomach and other health problems.

Known chemicals suspected to cause cancer and other debilitating illnesses exist at sites throughout the state. Examples are trichloroethylene, tetrachloroethylene, chlorinated dioxins and dibenzofurans, vinyl chloride, radionuclides, pentachlorophenols; poly chlorinated biphenyls, metals such as mercury and hexavalent chromium and other hazardous materials. A great number of contaminated sites likely exist in the state which have either not been discovered or are known to others and have not yet been reported to the department.

Thousands of new chemicals are created annually. There may be little or nothing known about their impact on human health and the environment. Many chemicals that are now known to be hazardous now were not considered hazardous in the past. Toxicological assessment work is just now beginning on the potential effects of several classes of chemicals, such as endocrine disruptors that may provide a new direction for remediation investigations and decision-making.

As new contaminants of health or environmental concern are regulated or as scientific research brings new health considerations to light, it often takes time for regulatory agencies and responsible parties to add or optimize treatment and technology or take other steps to address the new problem. This could cause a site that was historically declared clean to now need remediation. Such reassessments could cause fluctuations in the number of sites remediated even when assistance and enforcement activities related to existing rules remain constant and the long-term trend is upward.

Objective 1

Maintain assessment activities to ensure that at least 80 potentially contaminated hazardous waste sites are evaluated annually

Objective measures

Number of potentially contaminated hazardous waste sites assessed

Key strategy

Develop inventories of potentially contaminated sites for use in prioritizing risk for selecting sites to be remediated

Objective 2

Maintain oversight activities to ensure that appropriate remediation is conducted for at least 300 sites annually.

Objective measure

Number of sites with departmental oversight

Key strategies

Provide independent sampling and oversight of cleanup at current and formerly used U.S. departments of Defense and Energy facilities such as Weldon Spring and Lake City Army Ammunition Plant to minimize impacts to human health and the environment.
Oversee state lead contamination cleanups such as the Jasper and Neosho County lead sites.
Use the Cleanup Levels for Missouri (CALM) document to facilitate risk-based cleanups and appropriate reuse of property that results in economic development and protection of human health and the environment.

Land Disturbed by Mining Activities That Has Been Reclaimed

Why are these results important?

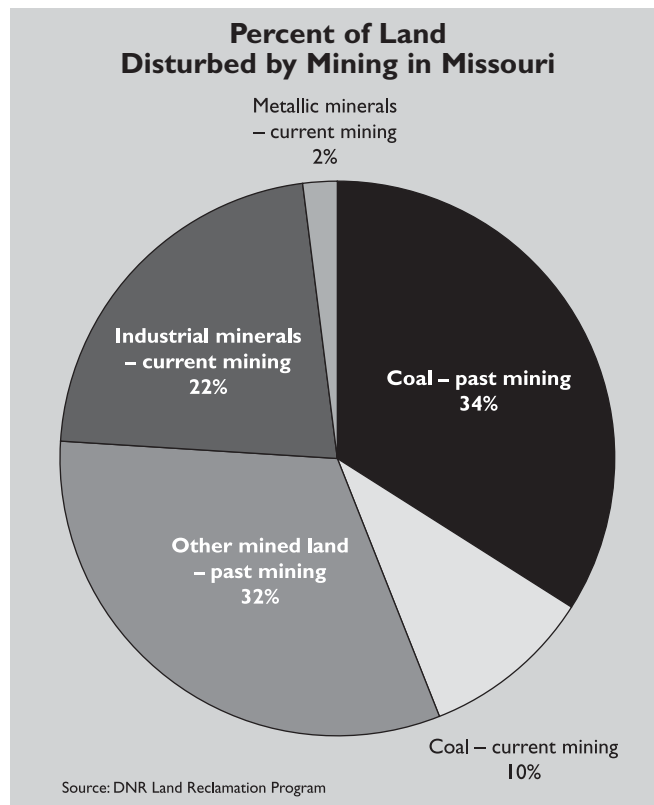
The percent of all mine-disturbed acres that are reclaimed demonstrates progress in the return of land disturbed by strip mining for coal to a productive capability equal to or better than it was before mining. In the past, some areas strip mined left untouched after mining created problems of drainage of acid mine wastes into the water. This often resulted in the degradation or destruction of aquatic habitat and the loss of water quality. Some strip-mined land did not support vegetation, earning the nickname of “moon land” due to its barren landscape. While coal mining in Missouri has decreased over the years, the need to reclaim any land disturbed by strip mining remains.

Trend analysis

The acres of land returned to productive use have increased on a nearly linear basis over the past five years. Approximately 90,000 cumulative acres will be returned to productive use by the year 2000 or 46.2 percent of mined land in Missouri.

Factors influencing the outcome

Each year mining disturbs more acres. Even though progress is made it appears static with the addition of newly disturbed acres each year and the reclamation of past disturbed acres.



Objective I

Increase the acreage of mined land returned to productive use from 89,724 acres in 2000 to 93,822 acres by 2004.

Objective measure

Acres of mined land returned to productive use

Key strategies

Ensure that active mines in Missouri are properly managed and work with the regulated community to implement current practices, including engineering, maintenance, revegetation, and adaptive reuse in reclamation practices. Provide technical assistance to landowners, operators and citizens.

Reclaim five abandoned mine land projects and annually reclaim four permit revocation or bond forfeiture areas. Perform liability releases on lands permitted for surface coal mining and industrial minerals mining.

Original Corners Restored in Missouri of the United States Public Land Survey

The origin of the United States Public Land Survey System in Missouri began in 1815 and was essentially completed by the General Land Office by 1855. Development and time has taken its toll on the USPLSS and by the 1960's it was estimated that 90 percent of the nearly 250,000 original corners of the USPLSS were destroyed or obliterated. Since 1970 the department has been involved in the recovery and restoration of over 81,000 of these corners. This work has been accomplished through legislation, rules, cooperative contracts with counties, private surveyors and

in-house staff. Committing resources through contracts, enforcement of regulations and in-house projects, corners have been placed in every county in the state and slowly the basic framework for all land descriptions and location of boundaries in our state has been improved. Currently, 31.6 percent of the land survey corners have been restored. Ultimately, the goal of restoring 90 percent of the original corners as opposed to 90 percent of the total corners being destroyed or obliterated in 1960 would provide for the best cadastre on a statewide basis in the Midwest.

Objective I

Increase the documentation of United State Public Land Survey corners in Missouri as follows:

- Corners reestablished, monumented and registered by 1 percent or 100 annually*
- One to three county-wide Geographic Reference System projects annually*
- 50 Geographic Reference System monuments established annually*

Objective measure

Percentage of U.S. Public Land Survey corners restored, reestablished and registered annually
Geographic Reference System projects, monuments and participating counties

Key strategies

Contract and encourage county commissions to participate in the County Surveyor Coop Remonumentation Program and work with private surveyors in the Missouri Association of Professional Surveyors to promote corner monumentation and filing.
Convert land survey data to digital data to enable geographic information system ability.
Meet with county assessors and municipal government agencies to promote the densification of Geographic Reference System control for mapping, Geographic Information System, and placing of State Plan Coordinates on corners of the United State Public Land Survey.

Enjoyment of Missouri's Natural and Historical Resources

AVAILABILITY OF MISSOURI'S STATE PARK SYSTEM AND OUTDOOR RECREATION OPPORTUNITIES

For more than 85 years, the Missouri state park system has been guided by a strong mission, set forth in the early Missouri Constitution. In 1917, one year after the National Park Service was established, the Missouri legislature acknowledged the cries of its citizens to preserve significant lands for recreation. The Missouri General Assembly passed a law establishing a state park fund. With the acquisition of Big Spring State Park in 1924, the Missouri state park system was created.

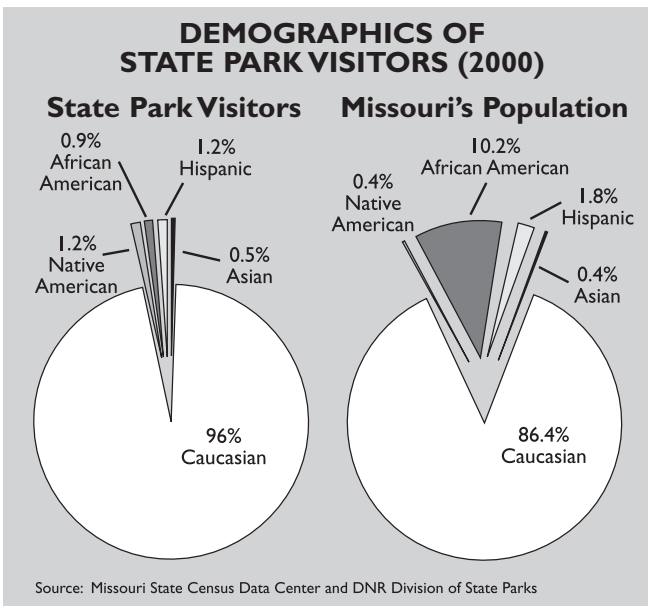
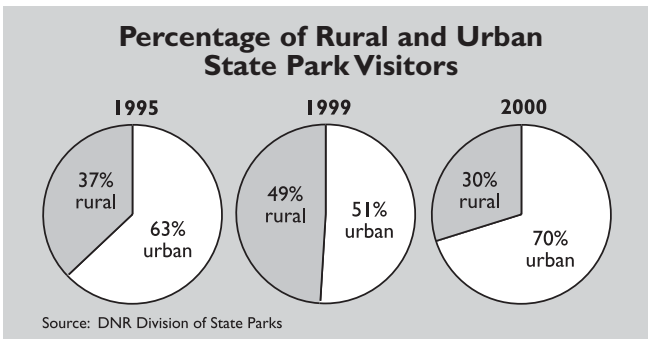
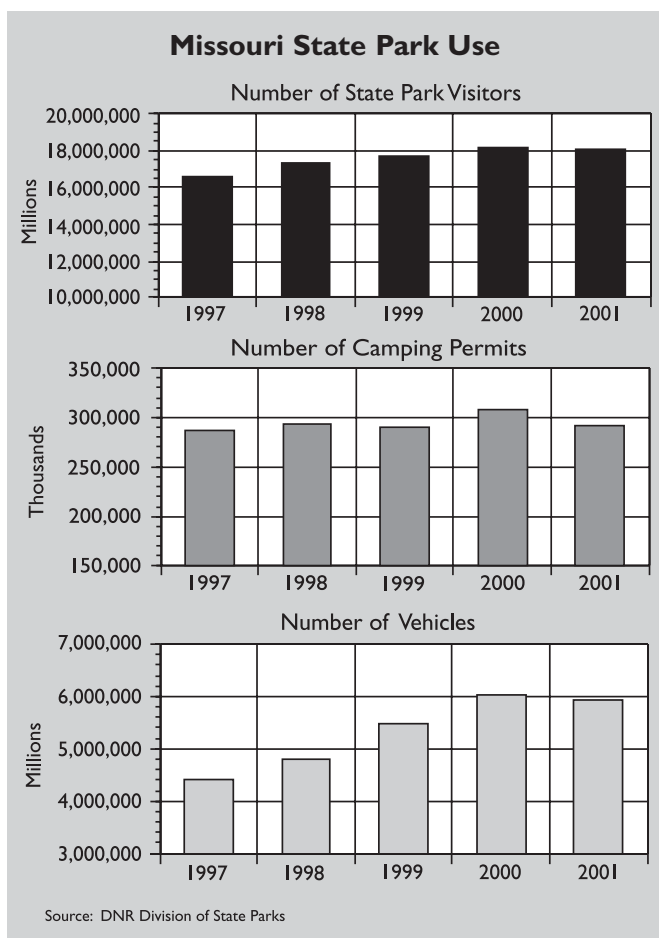
The Missouri Revised Statutes define a state park as "any land, site or object primarily of recreational value or of cultural value because of its scenic, historic, prehistoric, archaeological, scientific, or other distinctive characteristics or natural features". This formal definition has evolved into a three fold mission for the system: "To preserve and interpret the finest examples of Missouri's natural landscapes; to preserve and interpret Missouri's cultural landmarks; and to provide healthy and enjoyable outdoor recreation opportunities for Missourians and visitors to Missouri."

The state park system has been strongly supported in Missouri by the passage of the Parks and Soils Sales Tax. Through this funding, the department has maintained and enhanced the system to compete as one of the best in the nation while maintaining visitor satisfaction at a high level. This support is up for reauthorization by 2006.

Through its state park system and related outreach programs, the Missouri Department of Natural Resources continues its strong commitment to preserving the state's natural and cultural heritage and to providing recreation opportunities. The system strives to provide a balance between the preservation of the resource and enjoyment of these resources through recreational opportunities.

Why these results are important

Knowing how many people come through the front door of our state parks and historic sites helps us to plan in every facet of our operation. For example, the number of people in



a state park campground on a given weekend in the summer season helps us to plan the number of staff we will need to have on duty to clean the showerhouse and how many times they will be expected to clean it. Having a profile of park visitors helps in evaluating the availability of the state park system to a diverse population. It also helps us to target our marketing efforts to those populations not currently visiting state parks and historic sites.

Trend analysis

In 1939, 15 years after Missouri obtained its first state park, 70,000 visitors were recorded visiting Missouri's state parks. In 2001, attendance in Missouri's state parks was more than 18 million. This increase is likely due to the increase in number of parks and historic sites as well as the diversity of resources and recreational opportunities.

How Missouri compares to others



According to the National Association of State Park Directors (NASPD), out of 50 state park systems across the country, Missouri ranks twelfth in the number of people visiting state parks.

According to the Outdoor Recreation Coalition of America, over 75 percent of Americans age 16 and older participate in some form of outdoor recreation. These opportunities are provided in a number of settings including state parks, local parks and national park and forest lands.

Factors influencing the results

Probably the biggest factor influencing attendance is a visitor's previous experience at a state park or historic site. If they had an enjoyable experience, they are likely to return with family and friends and they will tell others. We know from our user surveys that 7 out of 10 visitors are repeat visitors.

What works

User surveys continue to be a valuable source of information for the division. The more we know about our users (who they are, where they come, and what they expect) the better we can provide for them. We also learn something about those we are not serving. This is sometimes more difficult to deal with but it makes us take a creative approach to our marketing efforts and how we might reach those we are not currently seeing as visitors to the system.

The Missouri state park system consists of 135,508.24 acres in 83 state parks and historic sites, which include the acquisitions of 253 acres for a new state park at the confluence of the Missouri and Mississippi rivers in St. Charles County in 2001. In addition, an agreement is being negotiated with the L-A-D (Leo A. Drey) Foundation to provide trails in a 61,000 acre section of Pioneer Forest located in southern Missouri. This arrangement will help to fill a gap identified in the Expansion Plan identifying the need for a large backcountry wilderness park.

Objective 1

Increase state park system opportunities available to residents of the St. Louis and Kansas City areas by a minimum of three new opportunities annually through January 2005.

Objective measures

New state park opportunities available to St. Louis residents

New state park opportunities available to Kansas City residents

Key strategies

Begin development of the recently acquired state park located at the confluence of the Missouri and Mississippi rivers and open to the public by 2004.

Promote the development of the Great River Resource Center as a regional information and interpretive facility in the St. Louis area in cooperation with the Departments of Conservation and Transportation and the Division of Tourism.

Increase the park system's planning and operational involvement in the Bruce R. Watkins Center in Kansas City to improve programming quality and availability.

Prepare a strategy for connecting the Katy Trail to Kansas City and extending the Katy Trail through St. Charles County to the new state park at the confluence by 2004.

Expand the WOW (Wonders of the Outdoor World) program to Kansas City area and seek minority participation by 2005.

Objective 2

Increase trail opportunities within the state park system by expanding the trails system by 5 percent by January 2005.

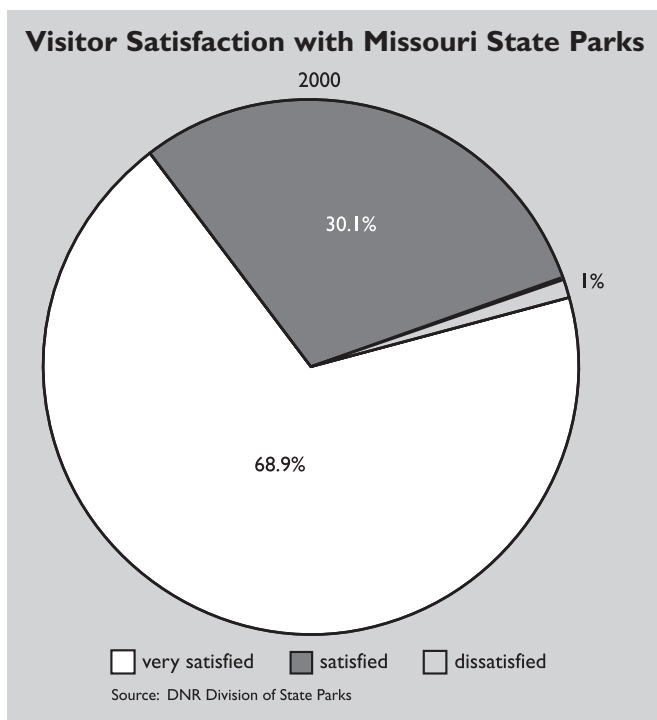
Objective measure

Miles of trails in state parks

Key strategies

Link Katy Trail State Park to Kansas City, Machens and Missouri / Mississippi river confluence

ENJOYMENT OF MISSOURI'S STATE PARK SYSTEM



Why the result is important

Customer service has long been a priority of the Missouri state park system. Cognizant of its stewardship role in managing Missouri's natural and cultural resources, the department is seeking to determine if it is indeed providing quality customer service and meeting the needs of its visitors. Since 1997, the department has commissioned visitor surveys at 26 of its 82 state parks and historic sites in an effort to learn more about its visitors.

Trend analysis

These surveys provide detailed profiles of who the visitors are. These surveys also show how we are doing regarding customer service and visitor satisfaction. Results consistently show that 99 percent of our visitors are satisfied with their visit. This includes satisfaction with staff, services and facilities in the state park system. For example, in 2000, overall, campgrounds were given the highest satisfaction score (3.56 on 4.0 scale) followed by signing (3.46), picnic areas (3.44), trails (3.42) and boat ramps (3.16). There was significant difference in satisfaction ratings between first time and repeat visitors.

Since the division began consistently surveying users in 1995, we notice from the results that visitors are consistent-

ly satisfied with their visits. Because of this consistent data, in 2001, in lieu of a visitor survey, the University of Missouri-Columbia completed a study for us titled *Recreational Vehicle Industry Trends*. With the popularity of camping in the state park system, and the amount of funds spent on campground renovations each year, we wanted to take a more focused look at the trends in the Recreation Vehicle (RV) industry and how this could impact our planning and operations of state park campgrounds. The results show that size and amenities associated with RV design have created changing demands on recreation provisions in campgrounds. These results will help us to plan for the future.

How Missouri compares to others



The Missouri state park system was recognized as one of four finalists in the 2001 National Gold Medal and State Park Awards Program.

The awards are presented to state park systems throughout the country for excellence in park and recreation administration and for outstanding service. This is the third time the state park system has received this prestigious award.

Factors influencing the result

Two primary factors influence our ability to keep our customers satisfied: understanding their needs by continually asking them either face-to-face or through surveys and addressing their concerns as best we can. Our experience shows that a strong commitment to customer service as well as resource protection and interpretation leads to satisfied visitors.

What works

Every state park and historic site conducts at least one annual public meeting to talk with visitors about their site. During the conceptual development plan process for the site, a minimum of 3 public input processes are conducted either through public meetings, open houses, surveys, or through the division Web site. Many of the parks and sites also have friends groups who assist with fund raising, programming and building constituents for their site.

In addition to user surveys, the division is conducting other studies to focus more closely on specific aspects of the state park operation including the *Recreation Vehicle Industry Trends* study discussed previously. The 2000 *Missouri State Park Visitor Attendance Count* was a study commissioned to provide spot evaluation and determine multipliers to enhance accuracy of visitation counts.

Objective 1

Maintain overall satisfaction with facility operation and maintenance at the satisfied level or higher in state parks through January 2005.

Objective measure

Visitor satisfaction with facility operation and maintenance

Key strategies

Complete General Management Plans for all facilities within the system and once completed, target 7 percent of the system's facilities per year for plan review clarifying the relationship of the threefold state park mission to each facility and addressing recreational conflicts as part of this planning process through January 2005.

Re-evaluate and update the 1992 Challenge of the '90's: Our Threatened State Parks to include collating the results of a survey questionnaire on the status and solutions to the system's documented threats, remedial actions taken and new threats perceived by 2005.

Initiate at least nine customer service enhancement projects by January 2005 such as increasing the number of electrical sites in the campgrounds.

Complete cyclic maintenance data entry for all parks and sites by January 2005.

Objective 2

Increase participation in interpretive programming from 9 percent to 12 percent of park system guest visitation by January 2005.

Objective measure

Percentage of visitors participating in interpretive programs

Key strategies

Continue to develop and encourage comprehensive training opportunities for DSP interpreters by expansion of the Annual Interpretive Training School and specialized training in interpretive philosophy and methods.

Develop a series of mid-season interpreter update training at the district level to be held in June or July each year update and re-energize seasonal and full time interpretive staff.

Encourage and support appropriate partnerships between the division's interpretive staff and other agencies, schools, and cooperating institutions to target user diversity.

Provide or participate in teacher workshops and events with the goal of helping provide more students with information concerning Missouri's natural and cultural resources and train teachers to make the best use of parks and sites as teaching tools.

Complete the work begun by the Interpretive Themes Task Force to review the interpretive themes and resources in DSP facilities paying special attention to under represented or non represented minority themes.

Objective 3

Replace approximately 21 aging and obsolete playground structures by the end of 2005.

Objective measure

Number of playground structures replaced

Key strategies

Identify obsolete, outdated play structures through a process of on-site inspections performed by trained personnel.

Coordinate purchase of new, replacement playground structures with division and private industry.

Oversee the delivery, construction and make final inspection of new playground units to ensure compliance with all current industry and CPSC (Consumer Product Safety Commission) safety standards.

Objective 4

Increase the participation of staffed state parks and historic sites in the division's Community Policing initiatives to 100 percent by 2005.

Objective measure

Number of state parks and historic sites participating in Community Policing Initiatives

Key strategies

Fully implement the Campground Watch Program in all state park and historic site campgrounds by 2005.

Involve 75 percent of field rangers in bicycle patrol in state parks and historic sites by 2005.

Survey state park and historic site visitors at least once per year to evaluate current Community Policing initiatives and develop strategies for furthering law enforcement and safety with the Division of State Parks.

Preservation of Missouri's Significant Natural and Cultural Heritage

PRESERVATION OF MISSOURI'S SIGNIFICANT NATURAL HERITAGE

At the heart of Missouri's natural heritage lies an irreplaceable blend of natural landscapes. By preserving the prairies, woodlands, forests, wetlands, streams and other native environments that lie inside state parks, the department protects remnants of our natural heritage. By preserving the integrity of native ecosystems, the result is superlative examples of Missouri's natural heritage. This contributes substantially to the conservation of biological diversity in Missouri that may be enjoyed by all.

Native landscapes are preserved through four programs: the state park Natural Areas, Wild Areas, Ecological Stewardship Management Areas and Natural Heritage Sites. The goal of each is to maximize the quantity of suitable area so designated and fully implement preservation practices such as prescribed burns and protection from exotic species.

Why these results are important

A complete integrated state park system should include high quality examples of the state's native natural landscapes. This allows protection of many of Missouri's plant and animals, including those which are rare.

Missouri's landscape features tend to be regionally oriented. State park holdings and designations reflect the diversity of natural landscape themes such as prairie, forest, woodlands and glades in their unique blend or expressions across the state.

Trend analysis

The charts show the progress the division has made over the years in protecting the special natural resources in the state park system. It helps us to show our commitment towards preserving and managing the natural environments placed in our care.

How Missouri compares to others



Missouri is a recognized leader among state park systems in restoring and actively preserving its state's historic natural environments. Several of Missouri's largest prairies, oak and pine savannas, glades, swamps and marshes survive in state parks through these efforts.

The most significant of these lands receive further protection through Missouri's Natural Areas program. Missouri is a national leader in this cooperative inter-agency effort to preserve a network of the very best examples of its native ecosystems. Today, more than 16,000 acres are protected through the Natural Areas program in Missouri's state parks.

The wildest and most spacious of lands may also be pro-

tected for their wilderness qualities by the Missouri State Park Wild Area Program. Missouri is one of only eight states to give formal wilderness protection for designated state lands. Wild Areas have been designated in eleven state parks – 22,000 acres total.

Factors influencing the results

The 1992 study of threats facing the Missouri State Park System quantified many ways that aesthetic degradation, air pollution, physical removal or loss of resources, exotic encroachment, visitor physical impacts, ecosystem degradation, park operation's and water quality changes all have an impact on the division's ability to preserve the natural heritage of the state.

Natural landscapes are dynamic and vulnerable to developments in or around the park boundaries. Most were damaged or altered earlier in Missouri's history. Those now protected in state parks are fragments of the original, and are often isolated from other natural areas. Many of their plant and animal species have been dramatically reduced or eliminated, and their character continues to change in response to modern regional developments more than natural processes.

These forces challenge our ability to restore and sustain healthy native ecosystems, and threaten the viability of the plants and animals that depend ever more upon the resources protected within state parks. They shape the

Profile of Significant Natural Landscapes Preserved in Missouri's State Parks (2001)

State park acres in Missouri Natural Area system	16,591 acres
Number of Natural Areas in state parks	38 areas
State parks acres in Ecological Stewardship Areas	67,167 acres
Percent of natural landscape themes in state parks	65%
Percent of natural landscape regions in state parks	79%
Percent of Missouri's rare and endangered species found in state parks	21%
Percent of Missouri's land area in state parks	< 1/3%

Source: DNR Division of State Parks

The Missouri State Park and Historic Site System Expansion Plan (1992) identified 84 potential natural landscape themes and 19 natural landscape regions within the six natural divisions of Missouri. A landscape theme includes items such as land forms, terrestrial ecosystems, aquatic ecosystems and geologic features. Landscape regions are areas with natural heritage significance based on major land forms. An example is the Salem Plateau, a region sharing essentially distinct vegetation and geology, regardless of the watersheds within the region. The six natural divisions for Missouri are: Glaciated Plains (example: Lincoln Hills), Big Rivers (example: Upper Missouri River), Ozark Border (example: Osage Plains), Ozarks (example: St. Francois Mountains), and Mississippi Lowlands (example: Crowley's Ridge).

department's programs designed to protect the diversity, function and integrity of native park ecosystems.

What works

The department preserves Missouri's natural heritage in state parks by: designating significant areas for protection; conducting management programs to preserve, monitor or restore them; and joining in partnerships that bring coordination, expertise and resources.

Approximately 75,000 acres of state park land has one or more designations as a Missouri Natural Area, state park Wild Area, or an Ecological Stewardship Area. In 2001, there were 38 Natural Areas in state parks. There were eleven Wild Areas in nine state parks, which totaled nearly 22,000 acres. Approximately 71,000 acres in 26 state parks were designated as an Ecological Stewardship Area.

In 2001, restoration projects were conducted in 24 state parks in prairies, savannas, glades and pine and oak woodlands. Substantial exotic species control projects occurred in at least 13 parks. Ninety-four prescribed burns on over 9,000 acres of land in 20 state parks benefited Missouri's natural landscapes, wildlife and plant life including rare and threatened species. New units added this year raised the cumulative acreage of parkland under periodic fire management to 31,000 acres. Biological inventory revealed that 38 state parks protect rare, endangered or threatened Missouri plants and animals – a total of 188 species in all.

Through several partnerships the department contributes lands, staff and resources to statewide conservation initiatives. We are part of the Missouri Grassland Coalition; the MoBird Project, and the interagency committee that is updating Missouri's Terrestrial Natural Community classification system. The department annually cooperates with Missouri universities and other entities to provide access to state park natural lands and supportive management. In 2001, forty-two new scientific research projects were initiated in Missouri State Parks. The Department of Natural Resources also currently chairs the Missouri Natural Areas Committee which was created in 1978 between the departments of Natural Resources and Conservation as a

way to identify and preserve significant landscapes.

The General Management Plans guide the development and operation of each state park and historic site in the system. One chapter of the GMP is the Natural Resource Management Plan that identifies all natural areas, wild areas, special ecological management areas and other natural resource designations or areas of natural integrity. The plan incorporates management activities and defines desirable outcomes of resource management and budgeting. In the early 1990's, the state park system established a process for identifying gaps in the system. The *State Park and Historic Site System Expansion Plan* identified areas of natural heritage significance that were deemed suitable for inclusion in the system. One gap filled was the acquisition of land on Crowley's Ridge, a site with scientifically distinct flora and fauna in Missouri's Bootheel.

Concerns

Aesthetic degradation, air pollution, physical removal or loss of resources, exotic encroachment, visitor physical impacts, ecosystem degradation, park operations and water quality changes all have an impact on the department's ability to preserve the natural heritage of the state.

The list of rare and endangered species changes every year. We continually review and evaluate the list and compare it to what we know are found in Missouri state parks. Management plans are likewise updated annually to respond to the current list of rare and endangered species. State parks occupy only 1/3rd of one percent of Missouri, yet 20 percent of the Species of Conservation Concern are represented therein.

Losses of landscape types not yet represented in the state park system are of concern. If those gaps in the system are lost due to development they can never be preserved.

An even greater concern is the health and vitality of landscape types that are already in the system and designated for protection. These typically have high social and biological value as publicly owned remnants of Missouri's native natural environments.

Objective 1

Decrease the threats and increase the preservation of native species and environments in state parks.

Objective measure

Threats to natural resources reduced

Key strategies

Update and revise the State Park Expansion Plan, identifying natural area acquisition priorities to complete the state park representation of all Missouri's natural landscape themes and regions based on the latest natural community classification information.

Complete an "optimal preserve design" evaluation for the most biologically significant natural resource parks, to identify acquisition interest that fulfill the Division mission, solve ecosystem threats identified in the 1992 State Parks Threats Study, and further the state park role in major state or regional biodiversity conservation initiatives.

With each Conceptual Development Plan review, expand park purchase units where beneficial to protect watersheds, viewsheds and the native species and environments of state parks.

Objective 2

To increase the quantity of existing state park lands zoned or managed for preserving Missouri's regional natural heritage themes, native species and environments; and expand planning efforts for them as follows:

Increase the Natural Areas Program by a minimum of 2,000 acres by 2005.

Initiate the Natural Heritage Sites program with 15 initial sites by January 2004.

Objective measures

Acres of park land designated as Natural Areas and Natural Heritage Sites

Number of sites with Natural Resource Management Plans.

Number of Wild Area Management Plans

Key strategies

Increase the number and area of Missouri Natural Areas designated on state park lands by at least two sites and a minimum of 2000 acres by January 2005.

Initiate a Natural Heritage Sites program by January 2003 that identifies restored or preserved native Missouri landscapes. Identify approximately 15 sites for inclusion by January 2004.

Develop Natural Resource Management Plans for each facility at a rate of five per year. Each completed plan shall be reviewed annually to examine results in meeting resource management goals.

Develop individual Wild Area Management Plans for all eleven units that identify site specific goals with their appropriate preservation/management criteria. Gather public comments for each and present completed plans to the Missouri State Parks Advisory Board by January 2005.

Objective 3

To increase the percentage of state park lands where natural environments are preserved through prescribed fire, ecosystem restoration, exotic species control or other means; and expand the science and technical programs necessary for their good care as follows:

Increase the periodic prescribed fire program on state park lands by 1,500 acres by 2005;

Increase the annual average number of acres burned on state park lands from 9,000 to 11,000.

Objective measures

Number of acres managed by prescribed fire

Number of stewardship projects completed

Number of biological inventory and monitoring programs completed

Key strategies

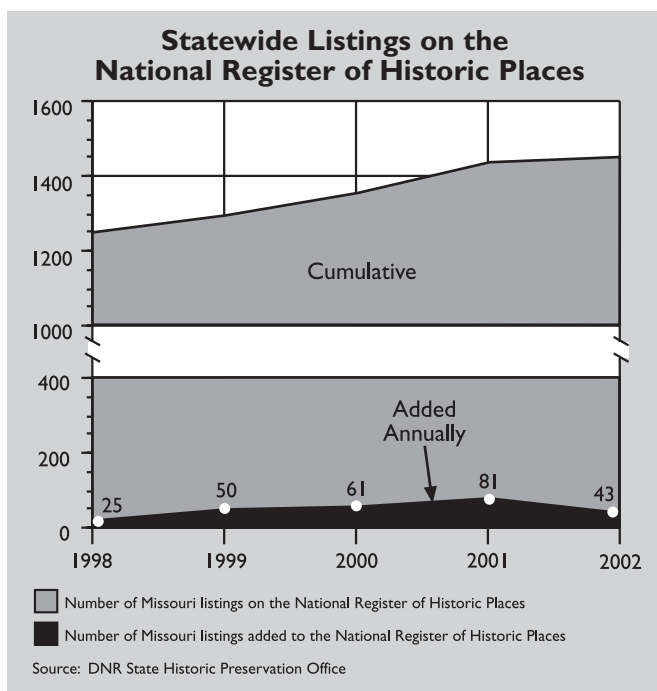
Expand the total number of designated park lands managed by periodic prescribed fire from 31,500 to 33,000 acres by January 2005.

Increase the average number of acres burned each year from approximately 9,000 to 11,000 over that same time interval.

Increase the annual allocation for stewardship projects to compensate for inflation, ensuring sustained funding for restoration of native ecosystems and species, protection and mitigation of wetland and riparian zone hydrology, control of invasive exotic species and reduction of other threats in state parks.

Expand the number and scope of biological inventory and monitoring programs, and the geographic information system and databases to make this information available to managers and the public.

HISTORIC PROPERTIES PROTECTED STATEWIDE



incentives or assistance from the provisions of the National Historic Preservation Act of 1966. It is important to remember that listing on the register does not ensure protection or preservation. The listing is recognition of the historical significance of the property.

While the recognition of an historic property's significance as provided by National Register listing is important, additional strategies are needed to ensure these properties' preservation. Maintenance and continued investment are vitally important in this effort. Since public sector dollars are limited, means and methods of leveraging private investment in historic resources are important in ensuring that Missouri's invaluable cultural heritage is preserved for future generations.

Trend analysis

The number of properties identified, evaluated and listed in the National Register of Historic Places has shown a steady upward trend in recent years. Two principle factors account for this trend: a general increase in awareness and appreciation of the importance of our cultural heritage and, more directly, the availability of significant economic incentives, such as the state and federal investment tax credits, to encourage investment in historic resources.

While hard to quantify, there appears to be a growing appreciation and acceptance of the importance of historic preservation in our society at large. The increase in spending for heritage tourism activities and the increased number of publications and television programs dealing with home renovation and repair are two indicators of the increased interest in preservation of historic resources.

Other sources of governmental funding, such as monies from the federal Historic Preservation Fund, have remained fairly constant over the years but, due to inflation, have actually declined in terms of effective purchasing power.

Number of Historic Properties Aided Through Financial Incentives

	1998	1999	2000	2001	2002
Missouri Historic Preservation Revolving Fund	10	12	16	17	16
Preservation Tax Credits	59	153	154	208	168
Historic Preservation Fund	11	17	17	15	14
Local assistance programs	51	61	68	101	91

Source: DNR State Historic Preservation Office

How Missouri compares to others



Missouri was one of the first states in the nation to establish its state historic preservation office in the wake of the passage of the National Historic Preservation Act of 1966. Missouri's rehabilitation tax credit is recognized as one of the most effective tools for encouraging investment in historic resources and has served as the model for numerous other states. In terms of the number of completed projects utilizing the federal tax credits, Missouri has been one of the leaders nationwide ranking fourth in the nation in federal FY' 2001. Certified rehabilitation expenses utilizing the federal credits in that year exceed \$133,000,000.

Factors influencing the results

Overall economic conditions in the state impacts the number of properties listed in the Register. A general slow down in the economy likely means a decline in real estate investment which would likely mean fewer owners seeking

Why these results are important

The National Register of Historic Places is the nation's honor role of historic properties recognized by the federal government as being significant at the national, state or local level. In order to be listed in the Register, the significance and integrity of a property or historic district must be carefully identified, documented and evaluated utilizing the criteria for listing established by the National Park Service, U. S. Department of the Interior.

Listing in the Register provides a significant degree of recognition as to a property's importance to the citizens of Missouri. Such recognition can be a vital step leading to the property's preservation. Listing also can be a key prerequisite for other protective measures or incentives, such as federal grant funding, utilization of federal or state tax

to have their property listed on the Register.

The level of federal grant funding for preservation activities will also impact the number of properties listed. A decrease in funding would mean fewer federal grants available to local governments or preservation organizations to carry out architectural surveys or to prepare National Register nominations.

The continued availability of federal and state preservation incentives is also a factor influencing the number of properties seeking listing on the Register. Measures that would limit the attractiveness of these incentive programs to owners would likely lead to a reduction in the number of owners seeking listing for their properties.

What works

Maintaining and enhancing the preservation partnership between and state and local governments is a key factor in increasing the number of properties listed within the state.

Local governments can play a vital role in identifying historic resources in their jurisdiction and the Certified Local Government program has been a key factor in increasing the capacity of these municipalities to carry out local preservation activities.

The federal and state rehabilitation tax credits have been major factors in fueling interest in listing properties on the National Register. Register listing, either individually or as a contributing element of a National Register historic district, is a prerequisite for obtaining the credits. The rehabilitation tax credits have been a major economic engine in spurring preservation investment in the state.

Spurred by revisions made to the National Historic Preservation Act of 1966 in the early 1980's, local governments are playing an increasing role in carrying out preservation activities in their jurisdictions. The number of communities enacting local preservation ordinances or participating in the department's Certified Local Government program have increased significantly.

Objective 1

Increase by 5 percent the number of identified properties evaluated according to National Register of Historic Places criteria by 2005.

Objective measure

Percent increase in the number of identified properties evaluated for NRHP eligibility between 2001 and 2005.

Key strategies

Encourage and provide guidance for locally initiated surveys and nominations.
Identify and prioritize under-served geographic areas for survey and nominations.

Objective 2

Increase the number of historic properties protected and preserved by 5 percent by 2005.

Objective measures

Percent increase in the number of historic properties protected and preserved between 2001 and 2005
Number of state offices located in historic buildings
Number of federal tax credit projects completed
Number of state tax credit projects completed
Number of properties assisted under the Historic Preservation Revolving Fund
Number of properties protected under local preservation programs

Key strategies

Develop partnerships with federal and state agencies that promote the protection and preservation of historic properties through joint projects and cross-training opportunities.
Promote participation in the Certified Local Government program and advocate the development of local preservation programs.
Develop programs and partnerships that promote awareness of the Revolving Fund in order to build the funds' effectiveness as a positive preservation tool.

PRESERVATION OF MISSOURI'S CULTURAL RESOURCE HERITAGE IN THE STATE PARK SYSTEM

Profile of Cultural Resources Preserved in Missouri's State Park System (2001)

Number of potential archaeological properties in the system	320
Percentage surveyed	15%
Of those surveyed, percentage with archaeological sites	3%
Of those surveyed, percentage with threatened archaeological sites	2%
Number of artifacts preserved	7,687

Source: DNR Division of State Parks

Archaeological sites are those where some evidence of archaeological material is found. Threatened archaeological sites are those archaeological sites deemed to be of significant importance with potential negative impacts from development.

Why the result is important

The department is responsible for preserving and interpreting the finest examples of Missouri's cultural landmarks that they may be enjoyed by all. Not only must each site exemplify some significant aspect of Missouri's history, but also it should be an integrated system of interrelated and complementary sites that provide an accurate and panoramic representation of Missouri's heritage. Currently 33 historic sites make up this system.

More than 400 buildings, structures and archaeological sites in the state park system are currently listed on the National Register of Historic Places. The department reviews all proposed projects in the system prior to construction to assure archaeological and historic features are protected. Clearances are given before a project commences and recommendations are made for those sites deemed threatened.

Trend analysis

These measures will help the department track the number of artifacts in the system and also the number of project requests for review. It is also the beginning of tracking those parks and sites completing cultural resource management plans.

Factors influencing the result

The State Parks Threats Study identified several factors that impact the cultural resources of the state park system. Deterioration of historic fabric and illegal archaeological collecting are two serious threats. Priceless artifacts have been stolen from sites such as the Osage Village and Towasahgy State Historic Sites. Artifact hunters regularly dig through remote rock shelters in Roaring River and Lake of the Ozarks State Parks to steal Native American relics.

What works

Begun in fiscal year 1996, the cultural resources fund was set aside to fund such things as acquiring objects of historical significance and conserving objects that were already in the system. Since the inception of the program, more than \$600,000 has been allocated to such projects as restoration of antique furniture, repair of a Civil War uniform and purchase of a Thomas Hart Benton print.

To better manage its artifact inventory, the division has budgeted to fund a registrar's position and to upgrade the system from a manual to a computerized system. To date, approximately 22,000 artifacts have been entered into the system. It is estimated there may be up to 100,000 artifacts in the state park system. Digital images and more accurate descriptions make it more complete for staff and researchers.

The General Management Plan (GMP) for each park and site identifies resources to be managed; determines relative significance of resources and themes; identifies appropriate resource management activities; measures the capacity for the site or park to meet operational standards for cultural resource management; and identifies research, collection, monitoring and inventory needs. The plan is a source of projects and planning for the cultural resource management fund and the two-year capital improvement budget plan. Plans have been begun on seven parks and sites.

Objective 1

To decrease threats to cultural resources in state parks and historic sites by 10 annually through capital improvements, small maintenance and repair projects, conservation of artifacts, and artifact and adjacent land purchase through January 2005.

Objective measure

Number of decreased threats to cultural resources

Key strategies

Work to revise 7 percent of the park system's facility conceptual development plans annually to identify key properties needed to preserve and protect park resources.

Purchase those key properties needed to reduce threats.

Focus a variety of resources to conserve and acquire artifacts to reduce threats.

Set priorities for capital improvements and small maintenance and repair projects involving cultural resources.

Objective 2

Increase the number of completed cultural resource management plans for each state park facility at a minimum rate of 7 percent of facilities per

year until all facilities have plans through July 2005.

Objective measure

The number of completed cultural resource management plans

Key strategies

Complete a program to identify or develop standards for historic structures and landscapes for use in evaluating and rating condition of elements to gain status toward stable and good condition as part of the cultural resource management plans.

Inventory and evaluate all historic structures and landscapes based on the established standards for resource type, condition and preservation treatments.

Contribute to the update the cultural resource planning process to identify gaps in major cultural themes and historic subthemes as identified for geographic and chronological criteria and adequate statewide and regional coverage.

Objective 3

Increase the number of potential archaeological properties evaluated in state parks and historic sites through the archaeological review process by 1 percent annually through January 2005.

Objective measures

Number of archaeological properties identified and evaluated in state parks

Percentage of properties surveyed of those reviewed in state parks

Key strategies

Evaluate threats to archaeological resources in state parks as a component of the project updated and assessment concentrating on needs for immediate inventory of sites and stabilization strategies for significant archaeological resources.

Develop materials that are designed to increase public awareness of the need for archaeological resource protection.

Increase resources to accomplish basic inventory needs.

Objective 4

Increase the percentage of state park artifacts fully documented within the automated cataloging system from 4 percent to 40 percent by January 2005.

Objective measure

Percent increase in the number of records entered into automated cataloging system per year

Key strategies

Provide staff with appropriate resources for computer cataloging.

Work with facility managers and district supervisors to develop annual computer cataloging targets.

Objective 5

Maintain eight to 10 formal assessment and conservation treatment projects annually that preserve significant cultural resources for interpretive use in state parks and historic sites through January 2005.

Objective measure

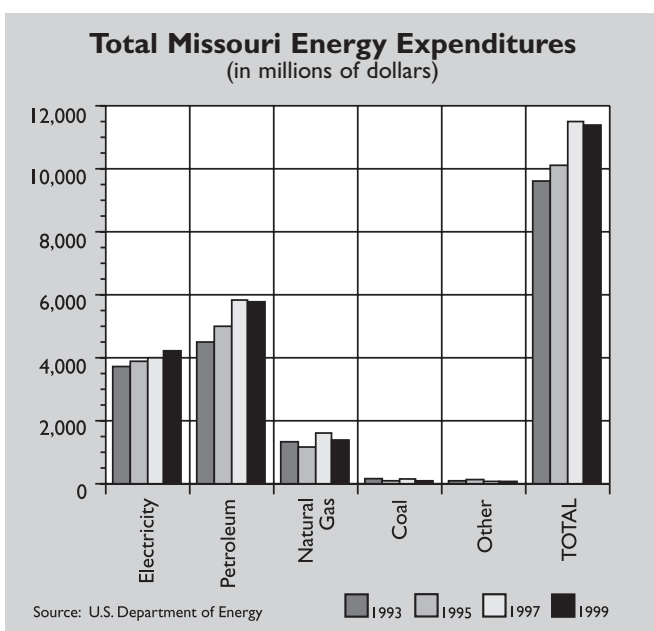
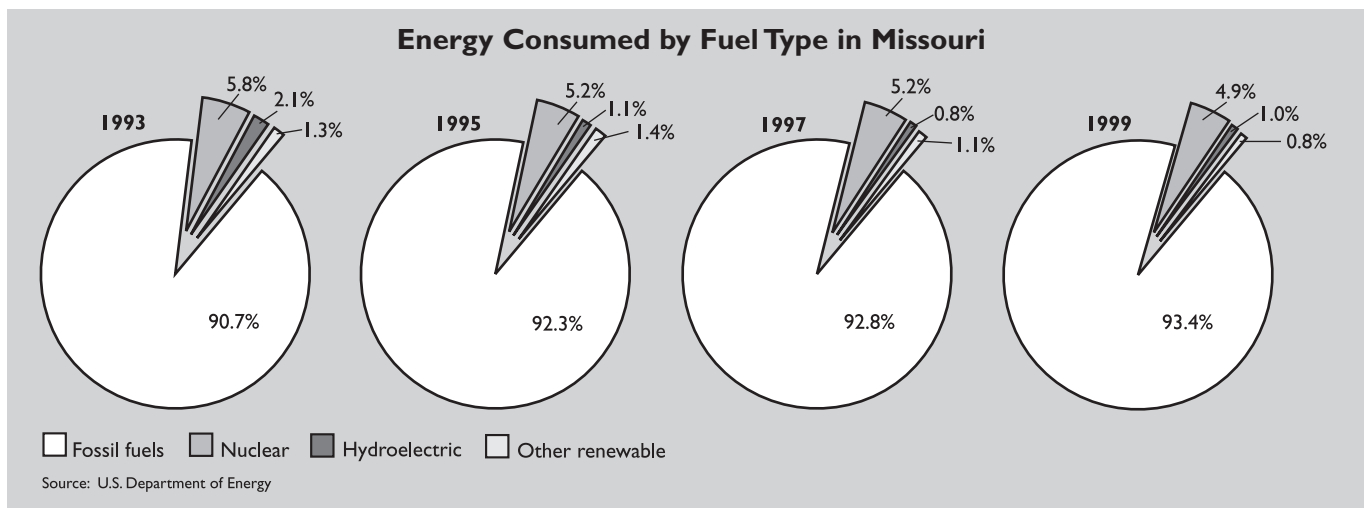
Number of formal cultural resource assessments and conservation treatments per year

Key strategy

Encourage all parks and sites with threatened cultural resources to apply for Cultural Resource Funding to address unmet needs and emergencies.

Missouri's Energy and Economic Security

RELIABLE POWER SOURCES FOR MISSOURI RESIDENTS, TRANSPORTATION AND BUSINESS



Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, 2000. Fossil fuels consist of coal, natural gas and petroleum minus ethanol contained in transportation fuels. "Other" energy use includes direct heat or electricity produced from geothermal, wind, photovoltaic and solar thermal sources; electricity produced from wood and waste at electric utilities; and ethanol used in transportation. It does not include firewood use.

Why these results are important

Energy and economic security have become even more critical as a result of threats of terrorism against the nation's energy system. Keys to energy security are uninterrupted power that fuels our daily activities and economic well being, secure supplies of fuel and electricity and unimpeded transportation of energy supplies through transmission lines and pipelines to where it is needed. Efficiency gains and the

use of distributed generation from renewable energy sources contribute to a power system that is more resilient to stresses on the distribution system, deliberate attacks and volatile market forces. These approaches serve as a hedge against future price volatility and supply disruptions.

Trend analysis

Missouri's consumption of energy has increased every year from 1992 through 1999 (a total of 24 percent) and our dependence on fossil fuels continues to represent the largest share of our energy use (93.4 percent). Since Missouri does not produce fossil or nuclear fuels within the state, the tables indicate that in 1999 we imported over 98 percent of the energy we consumed, up from 97.5 percent in 1992.

Our use of other energy sources has either decreased (renewable energy sources and nuclear) or remained the same (hydroelectric) from 1992 to 1999. "Other renewable" sources including direct heat or electricity produced from geothermal, wind photovoltaic and solar thermal sources, electricity produced from wood and waste at electric utilities and ethanol used in transportation, continue to represent the smallest share (less than 1 percent) of Missouri's energy mix.

Missouri's energy expenditures increased 15 percent from nearly \$10 billion in 1992 to over \$11 billion in 1999. More than half of the increase in expenditures was for petroleum fuels.

How Missouri compares to others



Missouri is ranked as the 20th highest energy-consuming state in the nation, and Missouri's commercial, residential and transportation sectors rank as the 14th, 15th and 16th highest

energy consuming sectors. A 1998 study by the Alliance to Save Energy, a not-for-profit national organization, identified the state of Missouri as 5th out of 34 states studied in the potential to save energy. The report cited the lack of a statewide energy code for Missouri's building stock as the primary reason for this high ranking.

In Missouri, fossil fuels represent over 93 percent of total energy consumption while nationally; fossil fuels represent 84 percent. The nation's use of other energy sources, including electric generation from waste and non-hydro-electric renewable energy, is nearly 4 percent while Missouri's use of these fuels is only 0.8 percent.

The development and use of renewable resources is a viable option for Missouri. We have solar, biomass and wind resources in Missouri and in surrounding states. Missouri is ranked 20th in potential for wind energy development, as measured by annual potential in the billions of kWh, factoring in environmental and land use exclusions for wind class of 3 or higher (U.S. Department of Energy, Pacific Northwest Laboratory, 1991). As an agriculturally productive state, Missouri also has substantial biomass energy resources for energy crops and crop waste, ground cover on Conservation Reserve Program set-aside acres, timber harvesting residues, primary wood processing wastes, municipal solid waste and animal waste.

Missouri has solar resources that are comparable to the desert Southwest in mid-summer. Mid-summer solar energy available for flat-plate collectors, such as photovoltaic panels (PV), in all Missouri counties receive 6 to 7 kWh per square meter per day, as compared to the desert Southwest that receives 7 to 8 kWh per square meter per day. One of the most important aspects of Missouri's solar resource is that it is most available when demand for electricity is highest – during the hot summer days when air conditioners place the greatest demand on the electric grid.

Factors influencing the result

Many different factors influence Missouri's energy consumption, fuel use and energy expenditures such as population and economic growth, political and military actions in oil-producing countries and national and state energy policies. Many states have adopted policies to encourage the use of renewable energy and investments in energy efficiency to achieve the resulting environmental, economic and security benefits to the public. The Missouri Energy Policy Task Force appointed by Gov. Holden in 2001, recommended incentive programs and funding such as low-interest loans or other financing, rebates or tax credits for efficient buildings and appliances, net metering and interconnection standards for small distributed generation systems and requirements for renewable energy use. Assessment of renewable energy resources and consumer information about fuel sources and opportunities for energy efficiency are also integral to achievement of these goals.

What works

Assessment of renewable energy resource potential is a necessary first step in the development of a diverse energy supply. To further this effort, the department's Energy Center is developing a model to help electric cooperatives and municipal electric companies assess biomass feedstocks for electrical generation or other energy needs. The department is pursuing wind assessment opportunities to help identify site-specific wind resources for development. Technical and financial assistance is provided through the Energy Efficiency Loan Program and the Low-Income Weatherization Assistance Program. Since 1989, the Energy Center has provided over 300 low-interest loans to schools and local governments for energy efficiency improvements that are saving these entities over \$7 million each year. Since 1977, more than 138,000 Missouri homes have been weatherized through the Low-Income Weatherization Assistance Program. Based on the number of eligible citizens it will take over 100 years to meet the outstanding need for weatherization services in Missouri at the current funding level that results in approximately 2,000 weatherized homes each year.

Information and outreach efforts are an important factor in encouraging efficiency and alternative energy sources. The Energy Center develops and delivers useful energy-related information and analysis to enable Missouri policy makers and the general public to determine public energy policies and private actions to promote dependable, affordable and environmentally sound production, distribution and use of energy. Fuel supply and price information is provided in the Energy Center's Missouri Energy Bulletin, a bimonthly publication distributed statewide and through public presentations, news releases, other written materials and accessible through the department's Internet web site.

Innovative initiatives and partnerships can achieve program results as well. The Energy Center is working with universities and Missouri's industries to develop action plans that support industry growth and competitiveness in international markets, help Missouri industries compete effectively for national resources, solve environmental issues and improve resource, operational and energy efficiencies. Another project focuses on the link between energy and the environment and integrating approaches and policies to achieve shared goals.

Concerns

Missouri has not yet adopted policies to encourage the use of renewable energy (such as incentive financial and regulatory programs, generation requirements, standards for interconnection and net metering). This will continue to be a barrier to growth of domestic renewable industries until the cost becomes competitive with the established conventional fuels (coal, natural gas and petroleum).

Objective 1

Increase renewable energy use from 0.1 percent in 2000 to 0.4 percent by 2005 and renewable energy produced in Missouri from 0.4 percent in 2000 to 2.0 percent by 2005.

Objective measure

Percent of renewable energy used and produced in Missouri

Key strategies

Assess Missouri's renewable energy resource potential and develop and distribute baseline data through initiatives such as a statewide wind assessment map, wind anemometer program and biomass assessment modeling tools.

Work cooperatively with energy and environmental regulators, policy makers, the agriculture sector, state agencies, organizations and the public to encourage the development and use of renewable energy and innovative technologies.

Work with state and local government agencies and the transportation fuels industry to encourage the availability and use of alternative fuels to meet statutory goals.

Objective 2

Increase energy savings of school districts and governmental entities adopting energy best management practices from \$870,478 in 2002 to \$1,250,000 in 2005.

Objective measures

Dollar savings

Btu savings

Key strategies

Provide additional energy efficiency loan assistance to public schools and universities and local governments through the leveraged loan fund.

Develop partnerships with other agencies to incorporate an energy component in programs that are funded with public dollars, such as state historic preservation programs.

Increase the number of municipalities, water districts, sewer districts and other water utilities that utilize energy efficient motors and electrical systems.

Objective 3

Increase the weatherization of low-income homes from 140,000 in 2002 to 146,000 in 2005.

Objective measures

Total number of low income houses made energy efficient

Annual cost savings (million Btus)

Key strategies

Provide training, financial and technical assistance to local weatherization agencies in the administration of the federal Low-Income Weatherization Program.

Develop partnerships to leverage weatherization funds with the private sector and with agencies administering other state low-income energy programs, to better coordinate programs to achieve long-term benefits from the installation of energy efficiency measures.

Integrate preservation practices and renewable energy technologies into weatherization programs, where practicable.

Public Service

INTEGRITY AND EXCELLENCE IN ALL WE DO

Over the past year, we have been working on improving our agency to maximize our performance. Taking action to evaluate, restructure, reorganize and reorient the department will improve communication both externally and internally.

We established the departmental Outreach and Assistance Center to integrate the services we provide that directly assist citizens, businesses and communities. The center includes our environmental assistance, energy, historic preservation, urban outreach and public information services.

We want to find solutions, whether that's providing education and information regarding resource issues; providing financial assistance through grants or low-interest loans or by simply putting communities and people in touch with the right resources that can help them.

The center serves as the liaison between all our department programs and those affected by what we do. Staff will provide financial and technical assistance to those who needs help. Providing a single point of contact for the department will allow us to better meet our responsibilities, serve Missouri citizens and protect the environment.

The Department of Natural Resources is an array of programs striving to protect and enhance our natural resources. This diversity of programs brings strength to the department and the opportunity to provide quality services in light of changing priorities, ongoing issues, and new challenges. A diversity of staff brings strength to our decision making and actions. The department strives to make its staff representative of the state. To accomplish this, a comprehensive effort to encourage minority and female students to pursue degrees in the natural resource field to training throughout one's career must be undertaken.

To enhance diversity in Missouri's business community, The Department of Natural Resources seeks to increase purchases from minority- and women-owned businesses. Efforts will be taken to identify what types of goods and

services the department purchases, targeting our efforts to identify minority- and women-owned businesses that can provide those items and communicating that information both within the department and with other state agencies.

Outcome measures

Satisfaction of :

- the general public with the Department of Natural Resources' performance
- regulated entities with the department's performance
- the department's employees with our performance
- minority- and women-owned businesses with the department's performance

Why these results are important

The Department of Natural Resources is the agency that protects the environment through assistance, education and regulation. The manner in which the department carries out its responsibilities has a major impact on citizens', businesses' and communities' acceptance and view of the department. The stakeholder's opinion is critical because the environment is better protected when citizens have a stake in and want to take care of the environment. Citizen interest and ownership can be enhanced through positive strategies undertaken by the department. Customer service, public access and education are positive strategies to accomplishing an improved and protected environment. Along with direct environmental indicators, the satisfaction of the public, regulated entities and our own employees with our performance are good indicators of our ability to do our job and to communicate our performance.

Diversity seeks to represent the degree of different values, opinions, ideas, experiences, and cultures encompassed in the department's decisions and actions. This measure also demonstrates how closely the department's workforce reflects Missouri demographics.

Objective I

Assure a prompt and proactive Missouri Department of Natural Resources

Objective measures

Total amount of pass-through funding distributed annually

Coordinated department response to resource issues as measured by number of issues resolved

Key strategies

Develop surveying strategy and use results of surveys to improve existing or develop new services.

Integrate databases and systems and incorporate geographic information system capability to allow for better analysis of and access to data by the public and staff

Continue to identify opportunities for continuous improvement and streamlining throughout the department to better serve the public.

Enhance opportunities for public input and discussions on issues.

Enhance diversity throughout the department, by aggressively recruiting minorities and women for the department.

Identify and target efforts to locate, register and utilize minority and women vendors for the types of goods and services that comprise the majority of the division's purchases. The department's Contracting and Compliance Team will be responsible for facilitating this effort.

Key Systems Improvement Plan

The department undertook four key system improvement projects during fiscal year 2002: water quality permits, air construction permits, air operating permits, and private water well certification. These projects were chosen as they impact two of the department's priority outcomes, clean water and air. Each project is working on implementing recommendations during fiscal year 2003.

During fiscal year 2003, the department looks to initiate at least two new projects: the state revolving fund process for wastewater and public drinking water facilities and review of permits provided by the State Historic Preservation Office. The state revolving fund and review of permits by the Historic Preservation Office impact efforts to maintain or improve water quality in Missouri.

The following is a summary of the recommendations made by each team.

Water Quality Permit Recommendations

- “Stock the Shelf” with permits for certain groups such as wastewater treatment facilities.
- Use Permit by Rule for storm water and wastewater.
- Streamline renewal of General Permits.
- Review and issue new minors and general permits out of regional offices. Review and issue new major and significant minor permits out of the central office.
- Enter geographic information system data outside of the permit process.
- Do water quality review prior to application. The regional offices will inspect a facility prior to application for a permit.
- E-mail public notices to public entities. Charge actual cost for paper copies.
- Update the permit manual and make it available on the Internet.
- Communicate with the applicant before actual application is made. The applicant can review the draft permit before it is put on public notice.
- End “no response” permits.
- Have Natural Resource Conservation Service staff engineer Confined Animal Feeding Operations facilities. Shift the issuance of letters of approval to the Natural Resource Conservation Service.
- End the requirement for reapplication for an operating permit after a construction permit is issued.
- Revise and make more flexible Chapter 8 of the Design Guide.
- Use electronic signatures and applications.
- Provide incentives for pollution prevention.

Air Construction Permit Recommendations

- Revise the exemption list in rule and make it available on the Internet.
- Implement Permit by Rule where applicable.

- Speed up the billing process.
- Create and implement a “No Permit Required” form.
- Pilot a team looking at decentralization of permit writing to the outstate offices.

Air Operating Permit Recommendations

- Create a one-stop completeness review and log-in.
- Provide more focused assistance to the regulated industries during permit development.
- Provide local air agencies, contractors and industry-specific tools to complete the permit application: templates, policies, standard wording, workload status and EPA guidance.
- Create a culture of sharing information and experience.
- Combine peer and executive reviews into one by the unit chief.
- Investigate further the elimination or reduction of requirements for basic permits.
- Make EPA and public notice periods coincident (since this recommendation was made it has been ruled illegal by federal courts).

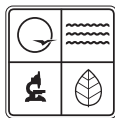
Private Well Certification Recommendations

- Encourage banks to require well certification for loan closing through education and outreach. If voluntary compliance is not effective, pursue legislation to make it mandatory.
- Educate the public and well owners about the need for properly drilled and certified wells to protect groundwater.
- Require all drillers and pump installers to use GPS units to provide accurate and consistent information on well locations.
- Send a brief quarterly status report to all companies covered by the Water Well Driller's Act.
- Require continuing education credits to renew permits for well drillers, pump installers, heat pump installers and monitoring well drillers. (This recommendation will be pursued by the Water Well Drillers Association with assistance by the department.)
- Request the Attorney General's Office to support greater enforcement against violators of the Water Well Driller's Act.
- Require well caps to be labeled with name of well driller and pump installer.



Integrated Strategic Plan


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Missouri
Department of
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